SCIENCE

FRIDAY, FEBRUARY 25, 1898.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE WASHINGTON ACADEMY OF SCIENCES.

THE scientific community of Washington is engaged in modifying its organization. The matter is of general interest, not only because of the importance of the body of investigators there assembled, but because the problems they are attempting to solve are analogous to the problems which confront the national scientific associations. There was a time when the American Association was the only scientific body of national scope, and, though it began as an association of geologists only, it gradually expanded in respect to subject-matter so as to provide sections for all important branches of scientific work. Of late years there has been a strong tendency toward independent organization of bodies of workers in various fields, and a score of national societies devoted to special subjects have sprung into existence, with the result that interest in and attendance on the meetings of the American Association have flagged.

In Washington the original organization was the Philosophical Society (1871), and its scope was as broad as science. Owing to peculiarities of its rules and customs, differentiation could not readily be accom-

plished by division into sections, and, as the scientific body grew, the students of special subjects organized separate societies, the Anthropologists in 1879, the Biologists in 1880, the Chemists and Entomologists in 1884, the Geographers in 1888, and the Geologists in 1893. The interest drawn toward these associations tended naturally to narrow the field of the Philosophical Society, and the only subjects remaining in its exclusive possession were physics, mathematics and astronomy.

There should be noted, however, an important difference between the National and Washington conditions. The American Association, although started by specialists, became a somewhat popular body and was peculiarly effective as an instrument for enlarging and extending popular interest in research. The special societies afterward organized are for the most part comparatively exclusive, being composed of experts and dealing with technical subjects. The Philosophical Society, on the other hand, had no popular tendency; it limited its membership narrowly, and excluded the press and public from its meetings, while several of the newer, specialized societies assumed popular functions. Their membership is practically open to all persons having sufficient interest to desire to enter, and the members are free to bring their friends to the meetings. The Geographic Society has gone much further than this, and courts a popular membership, to which it gives a generous course of illustrated lectures as compensation for annual dues.

Soon after differentiation began in Washington it became evident that divided interests were likely to affect unfavorably the general influence and external relations of the scientific body. Publishing through many channels, official and unofficial, Washington research makes comparatively little impression on the distant public, and even in our own country the fact is hardly realized that Washington is one of the world's chief centers of scientific investigation. Lacking a unified organization, workers in science were unable to secure for their collective opinion, as to matters of public policy affecting science, the consideration to which it was entitled. An effort was made in 1882 to unite all the societies by making them sections of an Academy, but the Philosophical Society, having the whole field of science within its designated scope, was unwilling to recognize the specialized societies as coördinate, and the project was abandoned. In 1888 a federation for business purposes was effected, under the title of the Joint Commission, and this has continued to the present time. At first it was a committee of delegates, but it was afterward enlarged so as to include the executive boards of all the societies. It published a joint directory of the membership, conducted courses of popular lectures and assumed various minor functions. In 1896 it became an instrument for the expression of the opposition of scientific men to the anti-vivisection bill, then pending in Congress, and it also officially endorsed the proposal of the Secretary of Agriculture that the scientific bureaus of the Department of Agriculture be placed under a 'Director,' who should be a scientific

man with status independent of politics. In the mode of procedure adopted by the Commission in attempting to influence legislation it was thought to exceed its constitutional powers, and the criticisms which ensued were among the influences which determined the societies to a reconsideration of the general subject of their federation. Much attention has been given to the matter during the past winter, with the result that a 'Washington Academy of Sciences' has been determined on, which shall be the federal head of the existing scientific societies. It is to have no control over the 'affiliated societies,' which retain their autonomy, but its members are to be chosen exclusively from the membership of the societies, its vice-presidents are to be nominated by the societies, and it is to have charge of all matters affecting the general and collective interest of their membership. Great pains has been taken in the selection of its nucleus, so that it shall be a thoroughly representative body from the start. The Joint Commission, itself a body of 96 persons, has by ballot chosen from the full membership of the societies 75 men, the criterion of selection being 'original research or scientific attainment,' and the nucleus of 75 is to organize the Academy and enlarge its membership. The policy of the new Academy and the choice of functions to which special prominence shall be given are yet to be determined; but its progress will be watched with interest and expectation, especially by those who appreciate the importance of the problem to be solved by the national organizations.

*THE SMITHSONIAN INSTITUTION.**

FINANCES.

THE unexpended balance at the beginning of the fiscal year July 1, 1896, as stated in my last annual report, was $57,065.78. Interest on the permanent fund in the Treasury and elsewhere, amounting to $56,400, was received during the year, which, together with a sum of $6,128.71 received from the sale of the publications and from miscellaneous sources, made the total receipts $62,528.71.

The disbursements for the year amounted to $58,061.99, the details of which are given in the report of the executive committee. The balance remaining to the credit of the Secretary on June 30, 1897, for the expenses of the Institution, was $61,532.50, which includes the sum of $10,000 referred to in previous reports, being $5,000 received from the estate of Dr. J. H. Kidder, and a like sum from Dr. Alexander Graham Bell, the latter a gift made personally to the Secretary to promote certain physical researches. This latter sum was, with the donor's consent, deposited by the Secretary to the credit of the current funds of the Institution.

This balance also includes the interest accumulated on the Hodgkins donation, which is held against certain contingent obligations, besides relatively considerable sums held to meet obligations which may be expected to mature as the result of various scientific investigations or publications in progress.

The permanent funds of the Institution are as follows:

Bequest of Smithson, 1846		$515,169.00
Residuary legacy of Smithson, 1867		26,210.63
Deposits from savings of income, 1867		108,620.37
Bequest of Jas. Hamilton, 1875	$1,000.00	
Accumulated interest on Hamilton fund, 1895	1,000.00	
		2,000.00

*Abstract from the report of S. P. Langley, Secretary of the Smithsonian Institution, for the year ending June 30, 1897.

Bequest of Simeon Habel, 1880	500.00
Deposits from proceeds of sale of bonds, 1881	51,500.00
Gift of Thomas G. Hodgkins, 1891	200,000.00
Portion of residuary legacy, T. G. Hodgkins, 1894	8,000.00
Total permanent fund	912,000.00

The Regents also hold certain approved railroad bonds, forming a part of the fund established by Mr. Hodgkins for investigations of the properties of atmospheric air.

By Act of Congress approved by the President March 12, 1894, an amendment was made to Section 5591 of the Revised Statutes, the fundamental act organizing the Institution, as follows:

The Secretary of the Treasury is authorized and directed to receive into the Treasury, on the same terms as the original bequest of James Smithson, such sums as the Regents may, from time to time, see fit to deposit, not exceeding, with the original bequest, the sum of $1,000,000; *Provided*, That this shall not operate as a limitation on the power of the Smithsonian Institution to receive money or other property by gift, bequest or devise, and to hold and dispose of the same in promotion of the purposes thereof.

Under this section, 5591 of the Revised Statutes, modified as above noted, the above fund of $912,000 is deposited in the Treasury of the United States, bearing interest at 6 per cent. per annum, the interest alone being used in carrying out the aims of the Institution.

During the fiscal year 1886–97 Congress charged the Institution with the disbursement of the following appropriations:

For International Exchanges	$19,000
For North American Ethnology	45,000
For United States National Museum:	
Preservation of collections	153,225
Furniture and fixings	15,000
Heating and lighting	13,000
Postage	500
Repairs to buildings	4,000
Rent of Workshops	2,000
Galleries	8,000
For National Zoological Park	67,000
For Astrophysical Observatory	10,000

The executive committee has examined all the vouchers for disbursements made during the fiscal year, and a detailed statement of the receipts and expenditures will be found reported to Congress, in accordance with the provisions of the Sundry Civil Acts of October, 2, 1888, and August 5, 1892, in a letter addressed to the Speaker of the House of Representatives.

The vouchers for all the expenditures from the Smithsonian fund proper have been likewise examined and their correctness certified to by the executive committee, whose statement will be published, together with the accounts of the funds appropriated by Congress, in that committee's report.

The estimates for the fiscal year ending June 30, 1898, for carrying on the Government interests under the charge of the Smithsonian Institution, and forwarded as usual to the Secretary of the Treasury, were as follows:

International Exchanges	$23,000
American Ethnology	50,000
National Museum:	
Preservation of collections	180,000
Furniture and Fixtures	30,000
Heating and lighting	15,000
Postage	500
Galleries	8,000
Repairs to buildings	8,000
Removal of sheds	2,500
Rent of workshops	2,000
National Zoological Park	75,000
Astrophysical Observatory	10,000

AVERY FUND.

In regard to the bequest of Mr. Robert Stanton Avery, referred to in previous reports, a definite settlement has not been reached with the heirs at law, so that it is not possible to state the exact amount that this fund will reach.

BUILDINGS.

No important changes were made in the Smithsonian Building during the year. Two museum storage sheds adjacent to the

building have been removed, with a great improvement in the appearance of the south front, while at the same time a source of danger from fire is averted. It is still necessary to retain some workshops south of the western portion of the building, no rooms being elsewhere available, but it is hoped that these also will soon be removed.

I may call attention to the need of additional room for the proper storage of such publications of the Institution and its bureaus as must be retained in reserve. These are comparatively few in number for each particular work, but the accumulations of fifty years occupy in the aggregate so much space as to demand more storage room than is now available and create a positive danger in the excessive weight that is now placed upon the floors of upper stories, while the work of distribution of publications is now carried on in very inconvenient and inaccessible quarters. I have under consideration the feasibility of some changes in the interior arrangement of the main north and south towers of the building which would render suitable for storage purposes much space which can not now be utilized.

I may also mention the very decided improvement that would result from the remodeling of the steep and long iron stairways leading to the great hall of the building, which is now used for archæological collections.

The improvements in progress in the Museum by the erection of galleries in several of the halls are alluded to elsewhere.

RESEARCH.

Although the time of the Secretary must be almost wholly given to administrative affairs, yet, as in years past, in carrying out the wish of the Regents and in continuation of investigations begun prior to my connection with the Institution, I have devoted such time as I could spare to researches upon the solar spectrum and to experiments in connection with certain physical data of aerodynamics.

Both of these investigations have reached a stage at which it is possible to give to the world somewhat full statements of results. In my remarks on the operations of the Astrophysical Observatory I discuss more fully the researches upon the solar spectrum.

In my report for the previous year I brought to the attention of the Board the fact that my experiments in aerodynamics had finally resulted in a successful trial on May 6, 1896, of a mechanism, built chiefly of steel and driven by a steam engine, which made two flights, each of over half a mile, and I appended a brief statement of my own and of Mr. Alexander Graham Bell, originally communicated in French to the Academy of Sciences of the Institute of France, describing the actual flight. Since that time a third and a much longer flight was made on November 28, 1896, with another machine, built of steel like the first and driven like that by propellers actuated by a steam engine of between 1 and 2 horsepower, making a horizontal flight of over three-quarters of a mile and descending in safety.

I have thus brought to the test of actual successful experiment the demonstration of the practicability of mechanical flight, which has been so long debated and till lately so discredited. To satisfy a nearly universal interest, I am now engaged in the preparation of a full description of these experiments since 1891, when my first memoir on aerodynamics was published. This memoir, with those on 'Experiments in Aerodynamics' and 'Internal Work of the Wind,' will form volume 27 of the Smithsonian contributions to knowledge, which will thus contain a complete record of all experiments carried on thus far under my direction upon this subject.

HODGKINS FUND.

The Hodgkins medals of award were received at the Institution on the 13th of July, 1896, and were transmitted on the same day to those competitors for the Hodgkins fund prizes who were recommended by the committee to receive medals. A replica of the medal was sent to each of the members of the Hodgkins advisory committee and to certain specialists who, without compensation, had rendered valuable aid in connection with the competition. A replica was also sent to the firm of Evarts, Choate & Beaman, the legal counsel of Mr. Hodgkins, and to Dr. Chambers, his medical adviser and long-time friend, as a memento of valued services rendered in connection with the Hodgkins bequest to the Institution.

In July, 1896, Mr. E. C. C. Baly, of University College, London, a Hodgkins competitor, whose memoir received honorable mention, was awarded a grant of $750 to enable him to prosecute further his investigations on the decomposition of the atmosphere by means of the passage of the electric spark. A report of the research, so far as it has progressed, has been received from Mr. Baly.

Under an additional grant to Dr. S. Weir Mitchell and Dr. John S. Billings investigations have been conducted in the Laboratory of Hygiene of the University of Pennsylvania, upon the effect which a prolonged exposure to vitiated air has upon the power of individuals to resist infectious diseases. Dr. D. H. Bergey, who conducted the experiments, reports that he subjected certain animals to an impure atmosphere, and found that while it apparently lowered their vitality he was unable to attenuate the fluids used for inoculating the diseases so that they would kill such a weakened animal while not affecting a vigorous one. Still, animals inoculated for tuberculosis died much earlier when exposed to impure air. As these results may doubtless be applied to all warm-blooded animals, including man, it would appear that we have here an important confirmation of the clinical observation that tuberculosis thrives most in vitiated air.

January 15, 1897, a grant of $500 was made to Mr. A. Lawrence Rotch, Director of the Blue Hill Meteorological Observatory at Readville, Mass., to be used in securing automatic kite records of meteorological conditions at an altitude of 10,000 feet or more. An additional grant of $400 was later made to Mr. Rotch for continuing his experiments in connection with the explorations of the upper air.

With a view to being prepared to apply most advantageously the accruing interest from that portion of the fund devoted to investigations connected with the atmosphere, the Secretary has conferred, during the year, with specialists in this country and Europe, upon the subject of researches suitable to be aided from the Hodgkins fund.

The six Hodgkins memoirs which have been published by the Institution were issued in February and March, 1897, and a copy of each was sent to all persons who had submitted papers in connection with the competition.

NAPLES TABLE.

As stated in my last report, the Institution has renewed the lease of the Smithsonian table at the Zoological Station of Naples for a second term of three years, this action being in accordance with the urgent solicitation of the faculties of several colleges and universities and of many of the leading biologists of the country.

At my earnest request Dr. Billings has continued as Chairman of the Advisory Committee, which has rendered most efficient aid in examining testimonials and in recommending action with regard to appli-

cations for the occupancy of the table. The following applications have been favorably acted upon :

Dr. F. H. Herrick, professor of biology at Adelbert College, Cleveland, occupied the table in November, 1896, and Dr. S. E. Meek, formerly of the Arkansas Industrial University, but more recently connected with the United States Fish Commission, received the appointment for two months in the spring of 1897. The application of Dr. H. S. Jennings, of the University of Michigan and later of Harvard, was approved for the three months during the spring and summer of 1897. Through the continued courtesy of Dr. Dohrn, in permitting two persons nominated by the Institution to occupy tables at the same time, the residence of Dr. Jennings began before the termination of Dr. Meek's appointment. Applications for the coming year are now under consideration.

EXPLORATIONS.

Ethnological and natural history explorations have been continued under the direction or with the assistance of the Institution in various parts of the world by the Bureau of Ethnology and the National Museum. This work is more fully described elsewhere, but I may mention here that a large number of objects of interest from various parts of the world have been added to the Museum collections, and much valuable information has been acquired regarding the history and the language of the American Indians. Among the explorations of the year were those by Dr. William L. Abbott in Siam, Professor O. F. Cook in Africa, Dr. E. A. Mearns in Minnesota and elsewhere, Mr. Frank H. Cushing in Maine, Mr. J. W. Fewkes in Arizona, Mr. E. T. Perkins in Idaho, Mr. W J McGee in Iowa, Mr. J. B. Hatcher in Patagonia and Tierra del Fuego, and Dr. Willis E. Everette in Oregon, British Columbia and Mexico.

PUBLICATIONS.

The publications of the Institution and its bureaus during the year comprised two works in quarto form, four in royal octavo, and fourteen in octavo, aggregating 9,630 pages, covering to a greater or less degree nearly all branches of human knowledge.

The Smithsonian Institution proper issues three series of works: The Contributions to Knowledge, the Miscellaneous Collections, and the Annual Report. By the bureaus of the Institution there are issued the Annual Report and the Bulletin of the Bureau of American Ethnology and the Proceedings and Bulletin of the National Museum, and the Secretary transmits to Congress the Annual Report of the American Historical Association. The Smithsonian Contributions and Miscellaneous Collections are printed at the expense of the Institution and the other publications from Congressional appropriations.

Contributions to Knowledge.—Two memoirs to this series were issued during the year, both having been submitted in competition for the Hodgkins fund prizes.

The memoir by Lord Rayleigh and Professor Ramsay describes the discovery of argon, for which achievement the authors were awarded the first Hodgkins fund prize of $10,000. It gives an account of the reasons which led the investigators to suspect the existence of a new element in the atmosphere and a detailed description of the apparatus and methods by which the presence of this hitherto unknown gas was definitely established. The importance of the discovery was recognized independently by the Institute of France, which awarded a prize of 50,000 francs, and by the National Academy of Sciences, which granted to the discoverers the Barnard medal.

The memoir by Professor E. Duclaux, of Paris, entitled Atmospheric Actinometry and the Actinic Constitution of the Atmosphere, describes the methods and results of

numerous experiments on the chemical rays of the sun by the exposure of oxalic acid to their action. Professor Duclaux found that the chemical action of the rays when the sky was overcast was much less than on a fine day and that with light cumulus clouds the combustion might be more active than with a clear blue sky or slight cirrus, so that it appeared evident that the chemical activity and hygienic power of the sun's rays are not related to the apparent fineness of the day.

Miscellaneous Collections.—Nine papers of the 'Miscellaneous' series were issued and others are in progress. The completed works were Smithsonian Physical Tables, by Professor Thomas Gray; Equipment and Work of an Aerophysical Observatory, by Alexander McAdie; Air in Relation to Human Life and Health, by Professor F. A. R. Russell; Air of Towns, by Dr. J. B. Cohen; Air and Life, by Dr. Henri de Varigny; Mountain Observatories, by Professor E. S. Holden; Methods of Determining Organic Matter in the Air, by Dr. D. H. Bergey; Recalculation of Atomic Weights, by Professor F. W. Clarke, and Virginia Cartography, by P. Lee Phillips.

The Catalogue of Scientific and Technical Periodicals, by Dr. H. Carrington Bolton, mentioned in my last report, is in type and will soon be published. It comprises the titles of more than 8,500 scientific and technical periodicals in all languages, adding 3,500 titles to the first edition, published in 1885.

There is also completed, ready for the printer, a voluminous supplement to Dr. Bolton's Select Bibliography of Chemistry.

As a special work, there has been printed the International Exchange List of the Smithsonian Institution, being a list of the foreign correspondents, aggregating 9,414 learned societies, museums, universities, etc., with which American publications are exchanged.

Annual Reports.—The Smithsonian Annual Report is in two volumes, one of which is devoted to the work of the National Museum. In the general appendix of Part I. are included memoirs on all branches of knowledge, selected chiefly from publications of learned societies of the world that are not readily accessible to the public, the basis of selection being that the papers are written by a competent person, give an account of some important or at least interesting scientific discovery, are untechnical in language and suitable to nonprofessional readers.

The History of the First Half Century of the Smithsonian Institution, outlined with some detail in my last report, is now printed and will soon be issued. The Institution was founded August 10, 1846, by Act of Congress approved by President Polk, and it seemed an appropriate memorial of the completion of its first fifty years to publish a volume which should give an account of its origin and history, its achievements and its present condition.

The editorial supervision of the volume was undertaken by the late Dr. G. Brown Goode, and to his thorough acquaintance with the history of the Institution, and his skill and critical knowledge, the comprehensive plan of the work is entirely due. At the time of his death, in September, 1896, the manuscript was sufficiently advanced to permit of its completion on his general plan.

The volume is royal octavo of 866 pages, with a preface by William McKinley, President of the United States, ex-officio the head of the establishment. It is illustrated by full-page portraits of James Smithson, the Chancellors, several of the Regents, the three Secretaries, and of Assistant Secretary Goode, besides illustrations of the Smithsonian Building and of the infra-red spectrum investigations by the present Secretary. The main divisions of the work

are fifteen chapters, descriptive of the history of the Institution, and a like number of chapters giving appreciation of its work in the several branches of knowledge, mainly by persons not connected with the Institution, followed by an appendix of 8 pages narrating the principal events in its history.

Since it is impossible in a single volume to exhaust the subject it became necessary to mention but briefly many topics which it was hoped might be elaborately treated. The book is printed from type in an edition of 2,000, with 250 additional copies on handmade paper. It is now classed in either of the regular series of Smithsonian publications, and will receive a special rather than a general distribution. This course is found necessary by reason of the cost of the work.

The Annual Report of the Museum for 1894, which includes several special papers by Museum officers or collaborators, has been issued, and the Museum has published a volume of Proceedings, and separate papers of other volumes, besides two octavo and two quarto bulletins, the contents of all of which are given elsewhere.

The Bureau of Ethnology has published three reports, the fourteenth, fifteenth and sixteenth, bringing the work down to the close of the fiscal year 1894–95.

The Annual Report of the American Historical Association for 1895 has been published, and the report for 1896 has been sent to the printer. These reports are transmitted by the Secretary of the Association to the Secretary of the Institution, who submits the whole or portions of the reports to Congress, in accordance with the act of incorporation of the Association. Prior to the report for 1894 the Institution had no share in the distribution of these volumes, but, beginning with the report for 1894, a limited number is available for purposes of exchange by the Institution with historical and other learned societies of the world. The reports contain papers relating to American history or to the study of history in America. A most important contribution in the report for 1895 is a bibliography of the historical societies of the United States and British America, covering 561 printed pages, which is a very useful reference work for writers and students of American history.

LIBRARY.

The library continues to grow steadily, the accessions in volumes, parts of volumes, pamphlets and charts reaching 35,912 during the past year. Special mention should be made of the gift of Mr. S. Patcanof, of St. Petersburg, of over 300 volumes, consisting mostly of oriental works and including some Arabic manuscripts and many rare Armenian publications.

As stated in my last report, the Secretary of State had named, in accordance with my suggestion, Dr. John S. Billings, United States Army, retired, Director of the New York Public Library, and Professor Simon Newcomb, United States Navy, Superintendent of the Nautical Almanac, as the delegates of the United States to a conference to be held at the instance of the British government at London in July, 1896, to consider the preparation of an international catalogue of scientific literature. This conference met July 14 to 17, 1896, twenty-two countries being represented. The conference drew up a plan which the respective delegates submitted to the countries they represented. The report of Professor Newcomb and Dr. Billings, submitted to the Secretary of State, October 15, 1896, recommended that the United States government should take part in this work and that the Smithsonian Institution be made the agent of the Government in this important scientific enterprise.

In accordance with this suggestion the

Secretary of State invited my opinion as to the propriety and feasibility of the United States taking part in this work through the Smithsonian Institution, and requested an estimate of the probable expense attendant thereto. To this I replied that I fully concurred in the view of the delegates as to the great importance of a successful execution of the conclusions of the conference and as to the propriety of this government taking its share of the proposed work by providing for the cataloguing of the scientific publications of the United States. This opinion is strengthened by the fact that the recommendations made are due to results emanating from an international conference, at which the United States was officially represented. and by the further considerations that the benefits to be derived from this undertaking are not only great and far-reaching for the scientific progress of America, but also of universal value, and that all the great and many of the smaller nations will take part in the work. I recognized also the propriety of the suggestion that the government should employ the Smithsonian Institution as an agent in this matter, particularly since the Institution first suggested this subject in 1855, and since it has been from its earliest organization interested in scientific bibliography.

I was, however, reluctant to commit the Institution to the appearance of soliciting Congress in this matter in any case, or to the undertaking of the enterprise, however worthy, unless provision could be made for the necessary expenses of the work. After considering the subject, it seemed to me that the work, if assigned to the Smithsonian Institution, would require a person of special qualifications to immediately assist the Secretary, together with a number of trained clerical assistants, and that the salaries for these persons and the expenses incident to the work would require an appropriation of not less than $10,000 per annum.

In accordance with this recommendation, Secretary Olney transmitted this correspondence to Congress. Although the Catalogue will not begin until 1900, much preliminary work will be necessary. I have accordingly brought the matter to the attention of Secretary Sherman, and the Department of State has agreed to submit an item for this purpose in its regular estimates for the year 1898–99.

Although the new building for the Library of Congress was completed in February, 1897, its occupancy had not begun at the close of the fiscal year. The east stack was provisionally assigned for the Smithsonian collection of transactions. In the past only this portion of the Smithsonian Library has been kept together, the remainder of the collection being distributed throughout the Library of Congress. I trust that in the new building, with its ample space and largely increased force, it will be found possible, in accordance with the resolution of the Regents in 1889, to assemble the entire collection in one place.

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*HARRISON ALLEN.**

In Harrison Allen this Association has lost one of its founders and most active members and its second president; science has lost a devotee; medicine has lost a specialist of high rank; the community has lost a man of lofty character and broad culture; there are doubtless others beside myself upon whom the announcement of his death on the 14th of November fell with the shock of personal bereavement, great and irreparable. During the present week Dr. Allen and his family were to have been my guests. What contrast could be greater than between the joys anticipated and the sad reality of the tribute which, at the re-

* Read before the Association of American Anatomists at its Tenth Meeting, December 28, 1897.

quest of our president, is now offered to the memory of our collaborator and friend?

Harrison Allen was born in Philadelphia April 17, 1841. His parents were Samuel Allen and Elizabeth Justice Thomas. His ancestors accompanied William Penn, and on his father's side he was descended from Nicholas Waln, distinguished in the early history of Philadelphia. As a boy Harrison was interested in Natural History, and at or before sixteen he went on an extended walking and camping trip in western Pennsylvania with associates of like tastes, amongst whom was George Horn, also lately deceased. Although he would have preferred pure science, financial considerations led him to study medicine, including dentistry.

After gaining his M.D. at the University of Pennsylvania, he was on duty for a time at the Blockley Hospital in his native city. On the 31st of January, 1862, he was appointed Acting Assistant Surgeon U. S. A., and Assistant Surgeon, July 30, 1862, serving in hospitals and in the defences of Washington until the acceptance of his resignation, December 8, 1865. He then ranked as Brevet Major. It was during the winter of 1862–63 that I first made his acquaintance at a meeting of the Potomac Side Naturalists' Club, attended also by Elliott Coues, Theodore Gill and others. Our army service did not throw us together, and I little thought then how dear Dr. Allen was to become to me in later years; for ten summers, indeed, we have been near neighbors at Nantucket, and I have been looking forward to the time when less pressure of work would permit me to enjoy his society more fully.

Dr. Allen now practised his profession with diligence and success. His dental education facilitated specialization in respect to the air passages, and in 1880 he was President of the American Laryngological Association. Of his strictly medical and surgical publications (numbering about fifty) nearly all relate more or less directly to his specialty.

But while he earned his living by medicine, it was in science that he lived, and it is this side of his career that interests us more as members of this Association. The subject of his thesis at graduation was 'Entozoa Hominis,' probably suggested by his beloved teacher, Joseph Leidy. His first scientific paper appeared in July, 1861, in the Proceedings of the Academy of Natural Sciences, and treated of certain bats brought from Africa by the explorer Du Chaillu; besides the two editions of his monograph of the bats of North America, published by the Smithsonian Institution in 1864 and 1893, respectively; to the same highly specialized mammals were devoted thirty of his scientific papers; just before his death he completed articles on the Glossophaginæ and on the genus *Ectophylla*. Yet, while remaining throughout life true to his first scientific love, Dr. Allen published valuable notes or memoirs upon many other subjects, notably the joints, the muscles, locomotion and crania; only a week before he died he handed over to the Wagner Institute of Science a study of the skulls from the Hawaiian Islands, much more elaborate than the previous one of the Florida crania. To him also was appropriately conceded the privilege of dissecting and describing the remarkable Siamese Twins.

Dr. Allen was emphatically, and in a double sense, a *fine* anatomist. So far as I know he seldom used the compound microscope, and availed himself little of the multifarious devices, chemical and mechanical, of modern histology. But his dissections of delicate organs were simply exquisite, demanding the most perfect training of hand and eye. Yet his habitual devotion to creatures of minor size did not deter him, during the past summer, from offering to

superintend, in behalf of the United States National Museum, the preparation of the skeleton of a sperm whale that came ashore near his seaside home.

Besides the papers and volumes already mentioned, Dr. Allen published, in 1877, 'Outlines of Comparative Anatomy and Medical Zoölogy,' and in 1881 completed an elaborate treatise on Human Anatomy, wherein stress is laid upon the medical and surgical bearing of the facts of human structure. Finally, and rightly to be mentioned in exemplification of his broad culture and sympathies, here is a discussion of 'The Life Form in Art,' and here an address on 'Poetry and Science,' delivered before a Browning Society. Nor must it be forgotten that music had always charms for our friend, and that he was an admirable player upon the flute.

But Dr. Allen was not merely a successful practitioner and an eminent investigator; he was also a teacher. In the University of Pennsylvania he was professor of zoology and comparative anatomy from 1865 to 1876, professor of physiology from 1878 to 1885; emeritus professor of physiology to 1891; professor of comparative anatomy and zoology, 1891–1896. He had been connected with his *alma mater* for more than thirty years, a period exceeded only in the case of five other professors. Dr. Allen was an active or corresponding member of numerous scientific societies in this and other countries, and was President of the American Society of Naturalists in 1887 and in 1888. A large part of his work was done at the Academy of Natural Sciences and published in its *Proceedings*.

The climax of Dr. Allen's useful and honorable career was reached in 1891. He was then fifty years of age, and for half that time had been connected with the University. In 1891 he became professor of comparative anatomy and zoology; President of the Contemporary Club of Philadelphia; Curator of the newly established Wistar Institute of Anatomy; President of the Anthropometric Society; then, too, he succeeded Professor Leidy in the presidency of this Association, holding office for two terms, or four years. No such combination of honors and responsibilities within a single year is known to me. During 1891 he published a dozen separate papers or addresses.

On the 29th of December, 1869, Dr. Allen married Miss Julia A. Colton; she survives him, together with a daughter, Dorothea W., and a son who bears his father's name, and who has already begun the study of the profession in which his father attained such eminence. Dr. Allen's private collections of bats and other specimens were bequeathed to the Academy of Natural Sciences. As a member of the American Anthropometric Society he directed that his brain should be entrusted to that organization. His body was cremated. The autopsy revealed the cause of his death as heart-failure, due to fatty degeneration; he had of late years also been subject to rheumatism.

It is idle to speculate as to what Dr. Allen might have achieved in pure science had his health been more robust, his nature more aggressive, and his time more nearly at his own disposal. For in considering the extent and value of his publications we must take into account two potent factors in his life: first, he was in active practice; secondly, he was eminently conscientious and recognized to the full that his patients were entitled to the best that he could do. Gratuitous attendance upon those unable to pay is so general in the medical profession that it would be invidious in me to more than record my personal knowledge of cases in which Dr. Allen's skill was exercised at his serious personal inconvenience and when in need of rest.

Whether due to his Quaker ancestry or

to principle, Dr. Allen was non-combative, and sometimes suffered injustice rather than engage in controversy. But in the advocacy of a principle he could be tenacious and even aggressive. Twenty-one years ago, during Huxley's visit to this country, an address on Medical Education was interpreted by Dr. Allen as controverting his doctrine as to the inclusion of Comparative Anatomy in a medical course. He promptly protested in a daily journal and discussed the subject with marked emphasis in a paper before the American Association for the Advancement of Science, in 1880. In view of the enormous prestige of Huxley's utterances upon any subject at that period, opposition to him demanded no little courage.

Preëminent among Dr. Allen's many admirable traits was his readiness to recognize the good qualities of others. Even respecting bores or those who wronged him I do not recall an unkind remark. So decided, indeed, was his predisposition to find some extenuating quality in even the most flagitious transgressor that had the devil been objurgated in his presence we may imagine him to add: "His satanic majesty has doubtless many sins to answer for, but let us not forget his extraordinary ability, activity, and enterprise."

In this package are all my letters from Dr. Allen, nearly forty in number. The first is dated December 2, 1867. As may be imagined, many of the more recent discuss the formation, progress and prospects of this Association. The second letter so clearly exhibits his modesty, his unselfishness, and his loyalty to his friends, that I quote from it.*

I could occupy much time with details of my dear friend's life and nature, but content myself with enumerating what seem to me rare combinations of characteristics. An ardent naturalist, and daily handling specimens variously preserved, he was fastidiously neat in person and apparel. He was simple in his tastes, yet conformed to the customs of the most conventional of cities. Rigid in the performance of duty, yet considerate of the shortcomings of others. Dignified, but not haughty. Affable, yet insisting upon the respect due to scholarship and culture. A delightful conversationalist, yet an equally accomplished listener. Mirthful, yet never condescending to buffoonery. Sociable in the company of men, yet neither uttering nor tolerating what might not be said before the other sex. Emulous of all excellence, yet never envious of those who surpassed him in special directions. "Let us cherish his memory and profit by his example." Nay, perhaps, take warning therefrom. For, humanly speaking, had he worked less incessantly, and especially less far into the night, he might be with us to-day.

Intimate as we were, and freely as we conversed upon matters involving the duties of human beings toward one another, no theologic point was ever mentioned between us, and I am absolutely ignorant of the nature of his religious convictions. But whatever may have been his belief, and whatever may be our own, I feel that no violence is done by the repetition of three verses of the twenty-fourth Psalm that have arisen in my memory repeatedly during the past six weeks while reflecting upon Harrison Allen:

"Who shall ascend into the hill of the LORD? or who shall stand in his holy place? He that hath clean hands, and a pure heart; who hath not lifted up his soul unto vanity, nor sworn deceitfully. He shall receive the blessing from the LORD, and righteousness from the God of his salvation."

BURT G. WILDER.

CORNELL UNIVERSITY.

*There was then vacant a high position for which he had been strongly recommended by one who had declined it. He asked if I were a candidate, implying that if so he would withdraw. Under date of December 16, 1896, he wrote: "I shall gladly be your disciple in all matters of nomenclature."

HIGH SCHOOL BOTANY.

In the Nebraska High School Manual, issued December, 1897, by the University of Nebraska, and the State Superintendent of Public Instruction, directions are given as to the teaching of Botany in the State High Schools, and especially those which are 'accredited' by the University. The substance of these directions may well receive the wider publicity which SCIENCE can give them.

"One year should be given to the study of plants in the high school. The old practice of beginning in the spring is no longer regarded as advisable by educators. The study may be made to alternate with some other subject, as Zoology or Physiology, or the alternate days may be used for laboratory work."

"Modern Botany requires a properly equipped laboratory. The room set apart for it must be well lighted, preferably from the north sky. It should be provided with firm tables 27 or 28 inches high, and there should be shelves and cases at the sides of the room. The microscopes must be from some good maker, so as to insure good results." Instruments by well known foreign and American makers are suggested, ranging in price from $16 to $20, and magnifying from 75 to 600 diameters. Dissecting sets and other necessary appliances are enumerated and their cost given.

"Some work may be done by the class, under the direction of the intelligent teacher, with but one microscope and the other appliances, but as soon as possible there should be in every high school six microscopes, each with its accompanying accessories. There should be, at the least, one-fifth as many microscopes as there are pupils in the class."

"*The Laboratory Work.*—In this year of work the pupil should study such selected plants as will give him a general outline of the Vegetable Kingdom, including a fair knowledge of the principal types of plants and the modifications they have undergone. For this purpose the following plants are recommended:

1. One or more protophytes, from the following list: *Chroococcus*, *Oscillaria*, *Nostoc*, *Bacillus*.

2. Several green seaweeds from the following: *Protococcus*, *Spirogyra*, *Vaucheria*, *Cladophora*, *Oedogonium*, and their degraded relatives *Mucor*, *Albugo*, *Peronospora*, etc.

3. At least one of the brown seaweeds: *Laminaria* or *Fucus*.

4. At least one of the red seaweeds: *Polysiphonia*, *Polcamium*, or *Corallina*.

5. Several sac-fungi, from the following lists: (*a*) *Erysiphe*, *Microsphaera*, *Podosphaera*, etc.; (*b*) *Plowrightia*, *Peziza*; (*c*) *Puccinia*, *Ustilago*.

6. Several higher fungi, from the following lists: (*a*) *Lycoperdon*, *Secotium*, *Ithyphallus*; (*b*) *Agaricus*, *Polyporus*, *Stereum*.

7. At least one of the mosses: *Mnium*, *Bryum*, *Timmia*, *Funaria* or *Hypnum*.

8. At least one of the fernworts: *Asplenium*, *Cystopteris*, *Pteris*, *Equisetum*, *Lycopodium* or *Selaginella*.

9. At least one of the gymnosperms: *Pinus*, *Larix*, *Abies* or *Picea*.

10. At least six angiosperms, as follows: (*a*) two monocotyledons, one of which has superior ovaries, as *Alisma*, *Trillium*, *Lilium*, *Erythronium*, etc.; the other with inferior ovaries, as *Iris*, *Amaryllis*, *Orchis*, *Spiranthes*, etc.; (*b*) four dicotyledons, one with superior ovaries and choripetalous corolla, as *Ranunculus*, *Capsella*, *Viola*, *Silene*, *Callirrhoë*, *Geranium*, *Potentilla*, *Fragaria*, *Astragalus*, etc.; another, with superior ovaries and gamopetalous corolla, as *Primula*, *Steironema*, *Phlox*, *Hydrophyllum*, *Lithospermum*, *Ipomoea*, *Physalis*, *Pentstemon*, *Mentha*, *Salvia*, etc.; a third, with inferior ovaries and choripetalous corolla, as *Epilobium*, *Oenothera*, *Mentzelia*, *Opuntia*, *Aralia*, *Cornus*, *Daucus*, *Pastinaca*, *Osmorrhiza*, etc.;

and a fourth, with inferior ovaries and gamopetalous corolla, as *Sambucus*, *Viburnum*, *Houstonia*, *Galium*, *Campanula*, *Vernonia*, *Aster*, *Helianthus*, etc.

In the foregoing work the pupil should get some idea of the structure of the whole plant. He should learn enough technical descriptive terms so that he can give intelligent descriptions of each plant. At every stage of the work the pupil should be required to make careful drawings in his note-book, accompanied by concise descriptions of essential characters."

Suggestions as to the proper selection of books for a small botanical library and the collection of a reference herbarium are given. Field work and the systematic determination of plants are encouraged, this work being regarded as a desirable part of the pupil's training, although it must not be permitted to occupy so large a portion of his time as was formerly the general custom.

It may interest botanists in colleges as well as in high schools to know that before these directions were issued a considerable number of the Nebraska high schools were already giving essentially the work outlined above, and there are many indications that encourage us to hope that it will not be long before this will be true of all.

CHARLES E. BESSEY.

EXTRA-ORGANIC EVOLUTION.

IN explaining the method of evolution Darwin and Wallace have laid great stress upon the struggle between *organisms*, Roux upon the struggle between the *parts of the organism*, and Weismann upon the all-sufficiency of natural selection. Darwin emphasizes *organic selection*, Roux *intra-organic selection*, and Weismann *germinal selection*. All progress is thus apparently organic. Heredity, at least with Weismann, is the continuity of the germ plasm, and progress is due to the survival and accumulation of advantageous congenital variations *within* the organism.

I wish to speak of what I may call *extra-organic* evolution. Progress has marched with colossal strides during the last fifty and even twenty years. Nevertheless, we see no corresponding advances made organically which may be deemed adequate to such progress. As far as our congenital or blastogenic qualities are concerned, we are probably little if any better than our forefathers of fifty or a thousand years ago. The progress actually made is out of all proportion to the advances made in our organisms.

Our sense and motor organs are essentially instruments and tools. So also, for that matter, is the brain. They are sifters, sentinels, receivers, transmitters, etc., all pressed into the service of the organism or some of its parts. The eye is manifestly an optical instrument, though a poor one, when compared with that additional eye or sense organ, the microscope or telescope. It is a well-known fact that it suffers from every defect that can be found in an optical instrument. It was useful in its time, and is so, I presume, to-day. Civilization, however, has taken its gigantic strides guided by extra-organic eyes.

Most, if not all the three hundred or more mechanical movements known to mechanics to-day are found exemplified in the human body. From an evolutionary standpoint it is still more important to note that all the machinery in the world, all the bars, levers, joints, pulleys, pumps, girders, wheels, axles, ball-and-socket movements, etc., etc., are but variations, extensions, adaptations of the accumulated advantageous variations and adaptations of the human organism.

Thus our sense organs are indefinitely multiplied and extended by such extra-organic sense organs as the microscope, telescope, resonator, telephone, telegraph, thermometer, etc. Our motor organs are

multiplied by such agencies as steam and electrical machines, etc., in the same manner. The printing press is an extra-organic memory far more lasting and durable than the plastic but fickle brain. Fire provides man with a second digestive apparatus by means of which hard and stringy roots and other materials for food are rendered digestible and poisonous roots and herbs rendered innocuous. Tools, traps, weapons, etc., are but extensions of bodily contrivances. Clothing, unlike the fur or layer of blubber of the lower animal, becomes a part of the organism at will. One becomes more or less independent of seasons, climates and geographical restrictions. Thousands of extra-organic adaptations are being invented (most of them really accidental variations) every day.

Professor J. Mark Baldwin, writing on this question of social heredity, defines it as 'the process by which the individuals of each generation acquire the matter of tradition and grow into the habits and usages of their kind.'* By social heredity I mean not only this, but also the transmission from the parents to the children of the improved environment, more especially of the extra-organic sense and motor organs. By organic heredity I mean, roughly speaking, the transmission of the congenital characteristics of the parents to the children.

By the latter process alone, all progress depends upon the transmission of variations occurring *within* the organism. Thus progress would be, as it has been, indefinitely slow. Moreover, these advantageous organic variations die with the individual, and must be born again, so to speak, with each new individual. This requires time. On the other hand, by means of social heredity each new member of the race has handed to him at birth, not only the accumulated organic advantageous variations of sense and motor organs (animals and the poor inherit in the same way!), but has handed to him the extra-organic adaptations which have multiplied so indefinitely in the age of civilized man. The vast importance of accumulation of capital is obvious.

In this way man's organism is indefinitely extended. He reads Aristotle, and his organism reaches back two thousand years. He reads the latest cable from Australia and Japan, and he listens at the antipodes. With an electric button he accomplishes herculean tasks. There are giants in these days.

The extra-organic part of his organism becomes in many cases as valuable to man as his organic part. Ofttimes for it he will sacrifice his life, as the soldiers throw their lives away on the battlefield to save the gun.

This is obvious and well-known. Such large requirements meeting the individual on the threshold of his life demand a large measure of plasticity. Adaptability to one's new environment is always the mark of high intellectual development. Such adaptability is rendered possible by the nature and growth of the brain. Of the 800 to 1,000 million nerve cells present in the human cortex, all are formed before birth. But all are not developed. Cell elements are present but immature, mere granules, nuclei which do not form a functional part of the tissue. Under certain conditions, however, they are capable of further development. With further growth and exercise nerve fibres appear and form functional systems.

It seems, therefore, that in addition to the cells and fibres connected at birth (and sometimes later), as in instincts, there is a mass of latent or potential nerve cells and fibres which *await connection*. These form probably the physical basis of our acquired (mental) characteristics.

Thus there is rendered possible the speedy

*SCIENCE, April 23, 1897. See also Lloyd Morgan, Habit and Instinct, pp. 340-343.

acquisition of knowledge of the past and new arrangements and adaptations to meet the requirements of a more exacting environment. The latent cells become functional, and new associational paths are formed which become, or may become, by the law of habit, just as fixed and, ontogenetically considered, as reflex, and organic as the most definite inherited reflex action and instinct.

Some such theory as the above seems to be necessary to explain the wonderful advance of modern civilization. It is certainly not explained by any one or all of the three processes mentioned above, namely, those of organic, intra-organic and germinal selection. It may however be considered as a continuation of the same fundamental process. If the organism were forced to evolve within itself, by the slow process of organic selection, all the adaptations necessary for such a civilization as we have to-day, it is obvious that after millions of years it would finally produce a world-colossus, or impossible gigantic monstrosity.

ARTHUR ALLIN.

UNIVERSITY OF COLORADO.

BINOCULAR FACTORS IN MONOCULAR VISION.

ALL experiments in monocular vision have to be made with one eye closed or covered. Some writers have maintained that binocular factors are by no means eliminated under these circumstances, but that the movements of the closed eye yield just the same sensation data as would result if the eye were opened. The following observations may aid in the solution of this problem.

If an observer closes one eye and looks steadily at an object situated in the median plane and at about the same elevation as his eyes, and then suddenly opens the eye that was closed, he will note an appearance of unrest in the object. Careful observation will show that the object seems to shift horizontally in the direction of the eye that was not closed. The shifting in apparent position becomes very noticeable when the eyes are alternately closed. The object will seem to move backward and forward in a horizontal line, always moving toward the eye that has just been closed. If the object is somewhat above the elevation of the eye there will be a vertical movement downward in addition to the horizontal. This apparent change in position may be observed best when looking at distant objects; the stars and moon show it very clearly. It is evident from these facts that the closed eye is not converged toward the same point as the open eye. At the moment of opening the eye there are double images, and these double images are crossed as is shown by the direction in which the object seems to shift. In fact, it is frequently possible to see the double images, and to note that the one which appears when the eye is open is on the opposite side from that eye, that is, crossed. The crossed images indicate that the closed eye is converged beyond the object. When looking at the stars or moon, however, in order to have crossed double images the eyes must be diverged, and the distance which appears between the images makes it evident that the divergence is considerably beyond the position of parallelism.

Helmholtz* and Le Conte† have both observed that when the muscles of the eyes are relaxed in drowsiness there is a tendency for double images, which indicates divergence of the axes, to appear. Le Conte has expressly noted that the degree of divergence is so great that the axes must be considerably beyond the parallel position. Evidently the facts observed when one eye is closed are related to those which appear in drowsiness. The closed eye tends to

* Physiol. Optik 2te Aufl., p. 633.

†Amer. Jour. of Sc. and Arts (3), ix., p. 160.

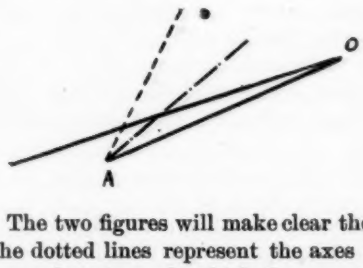
relax and in this relaxation diverges somewhat.

The observations here described have been confirmed by a number of persons. Only one case appeared in which the results were different. In this case, however, one eye is not normal in its vision and in drowsiness, as well as under the conditions discussed convergence rather than divergence was regularly observed.

The degree of divergence is difficult to determine, as the double images last only a very short time, the convergence adapting itself very soon to the object. The phenomena described appear most strikingly in the case of very distant objects, that is, where the optical axes were at the start parallel. On the other hand, where there is an effort required in the original convergence, strong enough to give a clearly conscious impression, the closed eye does not seem to relax as much. The degree of relaxation in the closed eye seems, in general, to be inversely proportional to the degree of effort required to maintain the original convergence.

The conditions may be modified so that relaxation shall result in convergence rather than in divergence. Take an object situated so far from the median plane that the opposite eye can just see it over the root of the nose. Suppose, for example, that the object is on the right. If now the right eye be closed, while the object is fixated with the left, and then be suddenly opened, it will be observed that the double images are not crossed. This indicates that the eyes are converged to a point nearer than the object. Care must be taken in this experiment to fixate the object with the left eye. If the object is seen in indirect vision the conditions are, of course, modified.

The only inference possible from these two sets of facts is that there is some line situated between the parallel and extreme lateral positions of the optical axes towards which the closed eye tends. Le Conte has surmised: "It is probable that in a state of absolutely perfect relaxation the optic axes coincide with the axes of the eye-sockets, and it requires, therefore, some contraction to bring the optic axes to a condition of parallelism and still more to a condition of convergence, as in every voluntary act of sight."* This surmise seems to be confirmed by the facts described and by the additional fact that a certain angle can be found between the position of parallelism and the extreme lateral position at which there is no tendency for the eye to change the degree of its convergence when closed. This angle corresponds with the angle of the axes of the eye-sockets. But in any case the tendency of the closed eye to diverge is checked when the effort towards convergence is strong enough to be noticeable.



The two figures will make clear the fact. The dotted lines represent the axes of the eye-sockets towards which the eyes tend to

* Loc. cit., p. 161.

turn when closed. The mixed lines show the actual direction of the eyes when closed and at the instant of opening. The complete lines show the direction of the axes of the eyes when open. *A* represents in both cases the eye closed, *O* the object.

There is one case which offers some difficulty to this explanation; unless, indeed, it is to be regarded as an illustration of the general principle formulated above that relaxation is inversely proportional to the effort of convergence. If, as in the instance represented in the second figure, the object be far to the right, but be fixated with the right eye rather than with the left, and then the left eye be closed and opened, we should naturally expect crossed images indicating convergence beyond the object. I have sometimes found this to be the case. Sometimes, however, I have observed no double images, or even at times uncrossed double images. It would seem that in these cases the closed eye in its strained position may be converged too much. This, however, is observable only at times; the regular results are double crossed images.

So far as convergence is concerned the open eye exerts the controlling influence; its position remains unchanged. But in accommodation the relaxation of the closed eye has an important influence on the accommodation of the open eye. If an object is fixated with both eyes, and moved away to the limit of distinct vision, it will be found on closing one eye that the outlines are no longer distinct. It is, for example, impossible to read print with one eye at a distance to which it could be just clearly seen with both eyes open. The figures on the moon grow very indistinct when one eye is closed. This indistinctness may be due, in part, to the enlargement of the pupil, for the pupil of the open eye is very much enlarged in sympathy with that of the closed. But this cannot be the whole explanation. For when one eye is covered up in such a way as not to exclude the light entirely the pupil of the fixating eye is not affected as much. The outlines, however, are indistinct even in this case, showing that the accommodation of the lens has undergone a change. Whether this change in the lens is one resulting in greater or less convexity I have not succeeded in determining. The fact that a voluntary accommodation for a nearer point does not, in my case, make the object clearer, but rather the contrary, would seem to lead to the conclusion that the lens has become more convex rather than less so. Yet this does not appear to be conclusive. The main fact, however, is that there is some change in the accommodation of the lens of the open eye when one eye is closed.

The bearing of these facts on many experiments in optics will be apparent. Wundt denies complete binocular convergence when one eye is closed, while Hildebrandt and Arrer* maintained the opposite. The truth seems to be that the closed eye follows the open eye to a certain extent, and to a certain extent obeys its own tendencies of relaxation. There is a change in the size of the pupil in both eyes and a change in the accommodation of the lenses.

CHAS. H. JUDD.
WESLEYAN UNIVERSITY.

* 'Philosophische Studien,' XIII., p. 116 seq. Other references given in the same place.

A NEW NAME FOR THE NOVA SCOTIA FOX.

IN the proceedings of the Biological Society of Washington, Vol. XI., March 16, 1897, pp. 53–55, I described the large red fox that occurs in Nova Scotia (and perhaps other parts of the Canadian and Hudsonian zones in eastern North America). Unfortunately, I used the subspecific name *vafra* that is already in use for a fossil fox —the *Canis vafer* Leidy (Ext. Mam. Faun. 1869, p. 368).

It therefore becomes necessary to re-

name the Nova Scotia animal, and I propose to call it *Vulpes pennsylvanica rubricosa* (Type No. 116, Bangs Coll., described under above reference as *Vulpes pennsylvanica vafra*).

OUTRAM BANGS.

JANUARY, 1898.

THE AMERICAN CHEMICAL SOCIETY.

THE sixteenth general meeting of the American Chemical Society was held with the Washington Section on December 29th and 30th. No place could have been more favorable for the meeting, as, outside of New York, Washington has the largest and strongest local section of the Society. As a result, this was the most largely attended meeting in the history of the Society. Every preparation had been made by the local committee and no meeting has been more successful or enjoyable. The sessions were held at the Columbian University and were opened by an address of welcome by President B. L. Whitman. The forenoons and Wednesday evening were devoted to the reading and discussion of papers. Among the papers read were the following:

Professor L. P. Kinnicutt, of Worcester, gave an interesting account of recent developments in the new methods of sewage purification, including the method by which a very considerable amount of the purification is due to giving the anærobic bacteria an opportunity to develop to the greatest extent.

An account was given, with illustrations, of Professor W. O. Atwater's respiration calorimeter, by means of which the total income and expenditure of heat and energy of the human body can be measured for periods of several days at a time.

C. A. Crampton, of the Treasury Department, read a paper on glucose in butter, illustrated by samples. Glucose is largely used as a preservative for butter to be shipped to tropical climates. The peculiar taste of some peoples was well illustrated by a sample of butter prepared for the island of Martinique, which was a bright orange-red color. Mr. J. P. Geisler, of New York, showed that the azo dyes which are used for coloring butter are very readily detected by absorbing with fuller's earth.

In the field of analytical chemistry Professor Francis C. Phillips read a paper on the determination of sulfur in gas-mixtures, giving description and illustration of an apparatus in which any desired amount of a gas (as natural gas) can be burned and the sulfur estimated as barium sulfate.

There was but one paper on didactic chemistry, by Professor Wm. P. Mason, of the Troy Polytechnic. In the very earnest discussion which followed the paper this question was raised: Is it wiser for a teacher to state scientific theories to his class dogmatically, thus giving them something tangible for a foundation, but knowing that, as they progress, they will have much to unlearn and modify; or should he confine himself strictly to statement of known truth, discussing conflicting theories with their arguments, pro and con, and, as a result, leave the mind of the student in a very hazy condition? It is not in chemistry alone that this difficulty arises.

Of papers devoted to pure chemistry, mention may be made of a series of papers on physical chemistry from the Cornell University laboratory; a discussion of the compounds of the higher haloids of elements of the Group IV., by J. F. X. Harold, of the University of Pennsylvania; a paper on the atomic weight of zirconium, by Professor F. P. Venable, of the University of North Carolina, and one on the chemistry and crystallography of some new rutheno-cyanids, by Jas. Lewis Howe and Professor H. D. Campbell, of Washington and Lee University.

President Charles B. Dudley's address on

Wednesday night was on the Dignity of Analytical Chemistry, and was a strong plea for this field from the standpoint of pure chemistry and has already been printed in this JOURNAL.

The election of Dr. Charles E. Monroe, of Washington, as President of the Society for the ensuing year was announced.

Thursday night was devoted to a banquet given by the local section at Maison Rauscher's, which was attended by nearly three hundred. President W. D. Bigelow, of the local section, presided, and Dr. H. Carrington Bolton acted as toastmaster. Among many notable speeches, a poetical effusion by Dr. H. W. Wiley, of the Agricultural Department, was perhaps the best appreciated.

Washington is so full of places of interest to the American citizen as well as to the chemist that considerable time was given to sight-seeing. The members were received by President McKinley at the White House; the various department laboratories were visited, as well as many other government buildings; a special excursion was given to Mt. Vernon, Friday morning, returning to Fort Meyer to witness the Cossack drill in the afternoon; and, perhaps not least in the estimation of many of the chemists, the great Heurich brewery was fully inspected and a bountiful collation in German style was partaken of. Finally, the courtesies of the Cosmos Club, which was made almost a rendezvous for the Society, added much to the enjoyment of the meeting.

J. L. H.

CURRENT NOTES ON PHYSIOGRAPHY.

SPECIAL FEATURES OF DISSECTED PLATEAUS.

PLATEAUS of horizontal strata, maturely dissected, offer a great number of variations upon simple types of hills and valleys; no two hills being alike, yet all having a strong family resemblance. The student soon passes from these widely prevalent forms to local examples of special features, which then receive an amount of attention quite out of proportion to the area that they occupy, but highly appropriate to their peculiar evolution.

C. F. Marbut describes some local forms of this exceptional kind in Missouri (Cote Sans Dessein and Grand Tower, Amer. Geol., XXI., 1898, 86–90). A short distance upstream from the fork of two streams the widening of their graded valley floors occasionally results in the lateral abstraction of the smaller stream by the larger one. An isolated hill or group of hills is then left between the forked valleys below the new cut-off. An example that bids fair to become typical for this country occurs in Benton County, Mo., where the town of Warsaw lies on the margin of one of these hill-groups, in the (former) fork of the Osage and the Grand River valleys. Three miles above the former junction of these streams the outward cutting of their meanders has worn through the dividing ridge, and has thus tempted the Grand to enter the Osage and desert its lower course. 'Cote Sans Dessein' is described as the narrow remnant of a hill-group of this kind, once included in the fork of the Missouri and Osage, but now reduced to a narrow isolated ridge a mile long and 200 feet wide, rising above the Missouri flood-plain. The name given to this ridge by the early *voyageurs* reminds one of the early naturalists and their 'queer fish,' now the treasure of the zoological evolutionist.

ARTESIAN WELLS OF COASTAL PLAINS.

THE artesian well should take high rank as a characteristic of the normal coastal plain. Simple structure consisting of discrete or of slightly indurated strata; decreasing relief and variety of form from the old shore line to the new; low-grade rivers extended from the old land, often deltaless

and open-mouthed by slight submergence; off-shore sand reefs, with inlets and off-sets; agriculture and forestry, rather than mining and manufacturing, as industries—to all these a good artesian supply of water is an important additional feature, especially to the towns on the low and smooth littoral plain and to cities on the shore or on the off-shore sand-reefs.

'Artesian well prospects in the Atlantic coastal plain region' is a timely summary, by N. H. Darton (Bull. 138, U. S. Geol. Surv.), of our present knowledge on this subject. It gives much encouragement for the future. A number of colored maps and corresponding sections make the report easily understood. The location of successful and unsuccessful wells is conspicuously shown. Repeating the curious example, already described by Darton, of wells in eastern Maryland supplied by water-bearing strata (aquifers) that pass under Chesapeake bay, we here find wells about Norfolk fed by aquifers that pass beneath the saline estuaries of southeastern Virginia. The greater amount of detailed knowledge concerning the well prospects in New Jersey than in the Southern States is a tribute deservedly earned by the New Jersey Geological Survey.

DRUMLINS IN NORTH GERMANY.

K. KEILHACK, of Berlin, describes a 'Drumlinlandschaft in Norddeutschland' (Jahrb. k. preuss. geol. Landesamt, 1896 [1897], 163–198), from which it appears that an extensive group of well defined drumlins lies east of the lower Oder, between the Baltic sea and one of the terminal moraines of that glaciated region. The hills, illustrated by a number of detailed maps, are of moderate height, with ratio of $2\frac{1}{2}$ or 3 between length and breadth; some of them being elongated ridges, three or four kilometers in length. Their distribution, indicated by diagram and map, is of especial value in a region where glacial striæ are rarely seen; for their axes show as ympathetic parallelism in a curving arrangement that strongly indicates a glacial flow toward the free morainic border near by. Now that drumlins have been found on the northern piedmont of the Alps by Sieger and Früh, in Sweden by de Geer, and south of the Baltic by Doss and Keilhack, they need not be regarded as such rarities in continental Europe as they were thought to be fifteen years ago.

THE VERNAGT GLACIER.

THE Vernagt glacier in the eastern Alps, famous for its flood-like advances into the Rofen valley (1599, 1680, 1773, 1845), and for the disasters caused by the outbreaks of the impounded valley stream, is made the subject of accurate measurement and description by Dr. S. Finsterwalder, of Munich; his monograph forming the first 'scientific supplement' to the Zeitschrift of the most flourishing of all Alpine clubs, the German and Austrian Alpenverein (Graz, 1897). The history of the glacier and the earlier maps of its form are carefully reviewed. A detailed account is given of the author's survey, the result being presented on a most beautiful map in several colors, on a scale of 1 : 10,000, with contours every ten meters. Then follows a discussion of the conditions of glacial motion, as here exemplified, and finally a consideration of the outbreaks of this remarkable glacier; their cause being ascribed to variations of snow and névé supply in the irregular upper reservoir. A special study follows on the end of the glacier in 1891, '93 and '95, by Blümcke and Hess.

W. M. DAVIS.

CURRENT NOTES ON ANTHROPOLOGY.

QUIPU READING.

IN the *Bulletin* of the Free Museum of Science and Art, Philadelphia, for December, 1897, Dr. Max Uhle has an article on

a modern quipu (his orthography is *Kipu*) from Bolivia. This one is not the same which he described in the *Ethnologisches Notizblatt*, of Berlin (referred to at that time in these notes). He obtained it from a native on a hacienda near Lake Titicaca, and its purpose was to keep the tally of the sheep, rams, ewes and lambs entrusted to his care. Others are used for reckoning the harvest and rendering accounts of various kinds. These are usually white in color only, and the count is registered by knots. Quipus of various colors are probably still in use, though Dr. Uhle was unable to secure specimens. He discusses four ancient and modern authorities on the significance of the hues, and believes that by further research we shall be able to extend our knowledge greatly of this curious method of recording facts.

ETRUSCAN STUDIES.

A writer somewhat well known for his archæological essays, Guiseppe Fregni, published last year a study of some of the leading Etruscan inscriptions, with what he alleges are translations (Delle più celebri Iscrizione Etrusche, p. 155, Modena, 1897). It is well illustrated and presents with care copies of eight or nine of the longer inscriptions and a discussion of the alphabet and its variants.

To the learned author the Etruscan problem is child's play in the simplicity of its solution. He allows himself humorous flings at the erudite obtuseness of previous students. All you have to do is to read the inscriptions in any or all of the Italic dialects, taking the words now in one, now in other, and, if they don't fit, cutting them up or expanding them, to make them fit, and calling in the Greek or Phœnician when the Italic dialects are wholly refractory. To be sure, they could be read, according to this method, just as well in English or Dutch or Choctaw; but this objection the author does not take into consideration. He presents complete and fluent renderings of all of them.

THE HUICHOLA TRIBE.

An interesting collection of ethnographic objects has been brought by Dr. Carl Lumholtz from the Huichola Indians. They dwell in an extremely mountainous part of western central Mexico, and are rarely visited by white men. They are pagans, though retaining some faint traces of the Christianity taught them in the last century by the Jesuits and Franciscans. Much of their ritual is occupied with 'rain-making,' and their symbolism is markedly aboriginal in spirit. The sacred plant *peyotl*, so common in the native rites throughout Mexico, and prized for the intoxication it produces, is held in high esteem among them.

The Huichola language has generally been considered a dialect of the Uto-Aztecan stock, and perhaps in them we may recognize some of the ancient 'Chichimecs.' Dr. Lumholtz has published some account of his researches in the last number of the *Bulletin* of the American Museum of Natural History.

D. G. Brinton.
University of Pennsylvania.

NOTES ON INORGANIC CHEMISTRY.

Satisfactory reductions in blowpipe analysis are often attended with more or less difficulty, as, for example, the reduction of tin oxid or barium sulfate. In the last *Zeitschrift für anorganische Chemie* a new method is proposed by Professor Walther Hempel, which he claims obviates many difficulties. A very small piece of metallic sodium is flattened out on a small piece of filter paper, and the substance to be examined is rolled up in this and wound with a close spiral of finest iron wire. After the excess of paper is cut off, the roll is slowly burned in the interior of a Bunsen flame and cooled in the stream of gas close

to the top of the burner. The product is then treated with a little water in an agate mortar, when the caustic soda formed is quickly dissolved and any metal present is left, generally in quantity large enough for easy examination. Sulfur and other substances are very readily detected in the solution. In case of silicates and borates the silicon or boron is left in the elementary state and easily recognized. In case it is desired to examine the constituents of the substances with the spectroscope, aluminum or magnesium filings are substituted for the sodium. The reaction is violent, but in small quantities unattended by danger. If it is desired to use larger quantities the substance must be diluted with an indifferent body, as salt when sodium is used, magnesium oxid with magnesium and aluminum oxid with aluminum. In this way considerable quantities may be used in a small iron crucible, and thus silicates decomposed in a few seconds. With care the process is even available for quantitative work.

IN the course of an investigation on the analysis of illuminating gas, Messrs. Harbeck and Lunge have discovered the existence of a stable compound of carbon monoxid with platinum and also with palladium. These are formed by leading carbon monoxid over the metal in a finely divided state. The metals are not completely converted into the carbonyl, hence their composition is as yet unknown, but they present an analogy to the volatile carbonyls of nickel and of iron. They have no catalytic power of causing the combination of gases, and their formation explains why the presence of carbon monoxid prevents the catalytic action of platinum and palladium. As it is well known that certain other gases also prevent this catalytic action, investigation will now be needed to see if they too form similar compounds.

IN a paper read before the Chemical Society (London), Messrs. Lean and Whatmough discuss the preparation of pure iodin. It is well known that iodin is very difficult to prepare free from bromin and chlorin. The authors find that cuprous iodid can readily be prepared free from these elements, and by heating it in a stream of dry air at 220°–240° most of the iodin is expelled and can be condensed upon a cold surface. This pure iodin has a black vapor and not the usual deep violet, thus confirming the statement of Stas that the vapor of pure iodin is opaque. Further, it emits no visible vapor at ordinary temperatures.

J. L. H.

SCIENTIFIC NOTES AND NEWS.

THE Senate confirmed, on February 14th, President McKinley's appointment of Mr. George M. Bowers as Fish Commissioner.

THE Prince of Wales has consented to act as patron of the coming International Congress of Zoology.

PROFESSOR AGASSIZ arrived in San Francisco on February 13th on the steamship *Australian* from Honolulu, returning from his investigations of the formation of coral islands.

PROFESSOR LUIGI CREMONA, who holds the chair of mathematics in the University of Rome, has been elected a correspondent of the Paris Academy of Sciences.

THE Senate of Glasgow University has appointed Professor Michael Foster, secretary of the Royal Society and professor of physiology in Cambridge University, to be Gifford lecturer in the Glasgow University in succession to Professor Bruce.

DR. NANSEN is now giving lectures in Great Britain, and will next month lecture in St. Petersburg and Vienna. He then expects to return home and devote himself to studying the specimens collected and the observations made during his expedition.

THE Cameron prize of the University of Edinburgh has been awarded to Professor T. R. Frazer for his researches in practical therapeutics.

THE death is announced of Dr. Samuel Newth, the author of text-books in physics and mathematics, and formerly Principal of New College, near London.

A BRASS tablet has been placed in the biological laboratory of Johns Hopkins University, in memory of Professor Humphrey and Mr. Conant, who died in Jamaica last summer. It bears the following inscription: "In memory of two devoted naturalists, who gave their lives to promote science, James Ellis Humphrey, associate professor of botany in this University, died in Jamaica, August 17, 1897, at the age of thirty-five years; and Franklin Story Conant, Bruce fellow in this University, died from illness contracted in Jamaica, September 13, 1897, at the age of twenty-seven years. The heart of him that hath understanding seeketh knowledge."

THE managers of the Royal Institution, London, have resolved that the centenary of the Institution (founded in 1799) shall be properly celebrated next year.

THE botanical collection recently formed at St. Mungo's College, Glasgow, by Dr. James Swanson, professor of botany, has been increased by a large number of specimens presented by Mr. F. W. Moore, Director of the Botanical Garden, Glasnevin, Dublin.

THE Biological Club of Princeton University has sent, through Senator Sewall, a protest against the bill interfering with physiological and pathological experiments in the District of Columbia that has been introduced into the Senate. Such protests have been sent by a number of scientific societies and should be neglected by none.

THE Ornithologischer Verein of Vienna has been merged into the K. K. Zoologisch-botanische Gesellschaft of that city, as an ornithological section of the Society. The Ornithological Section of the Zoological Society will retain the observation stations. A great number of them will keep a record of the migration of birds; materials will be collected for the study of birds' food, birds' usefulness and destructiveness. The result of the work at the different observation stations will be published in reports, which will be issued from time to time. The quarterly journal of the Ornithologischer Verein, *Die Schwalbe*, will be discontinued; Volume XXIV., No. 4, being the last number.

IT was arranged to devote the meeting of the Royal Society of February 24th to a discussion of the scientific advantages of an Antarctic expedition opened by Dr. John Murray.

THE fifth annual reception and exhibition of the New York Academy of Sciences will be given at the American Museum of Natural History, on Wednesday and Thursday, April 13th and 14th. The first evening will be devoted to a reception to the members of the Academy and their personal friends. On the afternoon of the second day the exhibition will be open to students and others, and in the evening to interested friends and affiliated societies in New York City. Professor George E. Hale, of the Yerkes Observatory, will also give the annual lecture before the Academy on that evening. The committee having the exhibition in charge are Messrs. Henry F. Osborn, Charles F. Cox, Reginald Gordon, Gary N. Calkins and Richard E. Dodge, chairman. Scientific workers having materials showing progress in science during the last year that they might wish to exhibit should correspond with the chairman of the committee, Professor Richard E. Dodge, Teachers' College, 120th Street, West, New York City.

PROFESSOR J. M. SCHAEBERLE writes to the *Astronomical Journal* that a cable dispatch received at Mt. Hamilton from Professor Campbell, who is in charge of the Crocker Lick Observatory Expedition at Jeur, India, states that most satisfactory photographs of the corona were obtained with three different telescopes. One set with a telescope 40 feet long, and two other sets with five-foot and three-foot telescopes. He also reports that the great equatorial extension of the corona, which formed such a conspicuous feature of the eclipse of January, 1889, has again been photographed. He also satisfactorily photographed the changes in the solar spectrum at the sun's edge with the aid of one of the spectroscopes, and probably obtained successful photographs of the reversing layer with the aid of a second spectroscope.

MR. F. H. KNOWLTON has just completed the manuscript of a 'Catalogue of the Cretaceous

and Tertiary Plants of North America,' embracing 2,652 species and varieties. In 1876 Professor Leo Lesquereux published a catalogue of similar scope, but at that time only 706 species were known, which shows that the knowledge of our fossil floras has increased rapidly within the past twenty years. The Catalogue will be published as a Bulletin of the U. S. Geological Survey.

THE *Moniteur Industriel* of January 29th states that the objections to wood as a pavement are appearing in very noticeable ways in Paris, and have been observed for a long time. Recently, the unhealthy and nauseating surface moisture and deposits have become so objectionable that it has been decided to endeavor to find a remedy. The men repairing the payment have been subject to epidemic illness. Cement will probably be used to cover the surface of the pavement in some cases, experimentally at least. Creoline is used as a disinfectant, meantime, and is said to have proved quite unsatisfactory. In cases of analysis by Drs. Miquel, Rodet and Nicolas, from 17,000 to 50,000 microbes have been found in a gramme of the deposit from the surface of the pavement. Asphalt blocks are recommended in substitution, and it is proposed that all wooden pavements within the city limits be removed.

THE Baldwin locomotive works, of Philadelphia, have received an additional order from the Russian government for fourteen locomotives, making in all thirty-four locomotives now in course of construction for the Russian government.

TROUT have been successfully introduced into the streams of Australasia, and the Government of New Zealand is now importing a large number of salmon over from Great Britain.

THE certificate of incorporation of 'The Thomas W. Evans Museum and Institute Society' has been filed in Philadelphia, the board of trustees consisting of leading citizens. It will be remembered that Dr. Evans left the larger part of his estate for the foundation of a dental institute to be located in West Philadelphia. Philadelphia is already well supplied with schools of dentistry, and it seems probable that this large sum of money, said to be about $4,000,000, will not be used to the best possible advantage, even supposing it be not divided among the lawyers.

THE following resolution was unanimously adopted at a meeting of the New York Academy of Medicine on February 17th: "*Resolved*, That the Fellows of the New York Academy of Medicine do earnestly recommend the establishment of a Bureau of Health, with the power to administer within constitutional limits the sanitary needs of the United States. The New York *Evening Post* advocates the measure, devoting to it an editorial, a column and a-half in length, in the course of which it says: "One of the most urgent needs of this country to-day is the establishment of a National Health Bureau, of which a supervision and harmonizing of quarantine procedures might well be a function, but by no means the most important one. To turn into useful channels, without delay, facts which patient toilers in science are daily bringing to light; to prosecute research in new fields of promise for the physical welfare of the citizens; to create a standard for public sanitary measures; to harmonize, and, when called upon, to direct such measures in different States; to investigate the great and growing problems of public water supplies which touch upon many fields involving the individual rights of associated States of the Union; to secure international cooperation in guarding or suppressing the centers of distribution of infectious material the world over; to collect statistics of disease and render available the fruitful lessons which they bear; to hold in readiness the machinery for the suppression of epidemic disease when called upon by stricken communities—these are some of the urgent functions of a National Health Bureau, whose organization cannot too soon be under way."

SECRETARY LONG has recommended that the corps of naval professors of mathematics be discontined as part of the naval establisment. His recommendation is accompanied by the following memorandum: "The reason for the creation of the office has passed away. These professors were, at first, teachers of midshipmen on board ship, and were thus exposed to the dangers of service in war and at sea. They

were, therefore, properly pensioned by a place upon the retired list. To-day their name is largely a misnomer. Under the law, one is assignable to the teaching of ethics and English studies, one of Spanish and one of drawing. In fact, only one teaches mathematics at the Naval Academy; several of them are on duty at the Naval Observatory; two are librarians; one is engaged in ordinance work, and another in the bureau of yards and docks. They have no service at sea, and there is no more reason why hereafter the retired list should be open to a new appointee to the work now done by this corps than to any other employee in civil life. If this recommendation is adopted by Congress it will be necessary to provide for the appointment of astronomers at the Naval Observatory, to take the places, as they shall become vacant, of existing professors of mathematics who now serve in that capacity. There should be five astronomers, as at present, and the salary of those hereafter appointed should be sufficient to make up for the refusal to them of the privilege of retirement, and also to secure men of high scientific attainments, adequate to the demands of one of the most capable observatories of the world. As the above astronomical corps is now full, no appointment under the new statute proposed will be necessary till a vacancy occurs."

Nature states that a meeting will be held in Manchester on February 16th to take into consideration such steps as may seem desirable to assist the executive committee in making the Zoological Congress this year thoroughly successful.

THE Physical Society of Paris has undertaken the supervision of a 'Bibliographica Physica' and has appointed a commission to arrange a method of bibliographical classification. The Physical Society and the Institute of Electrical Engineers, of London, are arranging for the publication of abstracts and papers.

MESSRS. MUNN & CO. have issued a reference catalogue containing a classified index of more than 10,000 articles that have appeared in the *Scientific American Supplement* since its establishment in 1876. The publishers offer to send the catalogue without charge, and it will prove of value to those who wish to consult any of the large number of valuable scientific articles that have been included in this publication.

UNIVERSITY AND EDUCATIONAL NEWS.

THE British government has expressed itself in favor of a Catholic University for Ireland, though it is not expected that any active steps towards its establishment will be undertaken during the present session of Parliament.

A BILL has been introduced in the lower house of the Prussian Diet giving the Minister of Education power to reprimand or withdraw the licenses of *Privatdocenten*. The bill is evidently intended to give the Government power to regulate the teaching of the lecturers, and has aroused much opposition, a protest against the measure having been signed by one-half of the professors in the University of Berlin.

THE Baldwin locomotive works of Philadelphia has presented the department of mechanical engineering of Columbia University with the locomotive exhibited at the World's Fair valued at about $12,000. Within the past few months donations of machinery to this department have been made valued at $60,000.

PROFESSOR LESTER F. WARD will give two courses of lectures, one on pure sociology and one on applied sociology, at the University of West Virginia during the summer quarter.

DR. KARL HÜRTLE has been promoted to a full professorship of physiology at the University of Breslau, and Dr. Anschütz to a full professorship of chemistry at the University of Bonn. Dr. Wiechert has been appointed associate professor of terrestrial magnetism in the University of Göttingen, and Dr. Eugen Meier, of the Polytechnic Institute of Hannover, professor of technical physics in the University of Göttingen.

DISCUSSION AND CORRESPONDENCE.

PRESIDENT MC'KINLEY'S APPOINTMENT OF A FISH COMMISSIONER.

TO THE EDITOR OF SCIENCE: Under the head of 'Scientific Notes and News,' the last number of SCIENCE contains remarks concerning the President of the United States which are unjust, untrue and malicious, and which as an associate

editor I disclaim. I beg, therefore, that you publish this letter in the next issue.

J. W. POWELL.

BUREAU OF AMERICAN ETHNOLOGY,
WASHINGTON, D. C.

[In view of this letter and of others that have been received it is to be regretted that the note in question was admitted, especially without the signature of the writer. Leading newspapers that have supported President McKinley, such as the Philadelphia *Ledger*, the New York *Evening Post* and the Boston *Transcript*, have characterized his action in the appointment of a Fish Commissioner as weak and illegal, and it was supposed that this point of view would be shared by all men of science, however fully they might in other respects support the present administration.—ED. SCIENCE.]

A CHARACTER REGULARLY ACQUIRED BUT NEVER INHERITED.

ONE cause of the conflicting testimony concerning the inheritance of acquired characters is the difficulty of deciding whether a new or abnormal structure appeared in the individual after birth through a somatogenic change, or whether it was due to a prenatal or blastogenic variation. Whatever value we may attach to the present case, it is certainly interesting and avoids any difficulty of this kind.

The sternum of heavy perching birds belonging to the order Gallinacei, which includes the domestic fowl, the turkey and their wild ancestors, as well as the grouse, has the well-known keel shape, and for some months after birth is semi-cartilaginous, and therefore soft and yielding. The keel is applied like a blunt knife edge to the hard perch. The transverse line of pressure caused by the weight of the body not supported by the legs soon produces a deformity which lasts for life. A cushion-shaped enlargement may be formed, or the keel may be bent or twisted in a variety of ways. Some such deformity is inevitable from the mechanical conditions present. Moreover, this has been taking place not merely for a few generations, but during the whole course of the later evolution of these animals. At the end of each generation the individual variations thus acquired are completely effaced, and the young always begin life with the sternum normal.

The keel of the sternum in carinate birds has apparently arisen in correlation with the pectoral muscles concerned in flight, and if we assume that the variations which led to the keel were of a blastogenic character the inheritance of somatogenic changes which deform this structure could not at the same time have occurred. The keel has attained its present form, that of a thin vertical plate, in spite of those somatogenic changes in the life of the individual which tended to flatten and deform it.

No direct evidence that mutilations or deformities of a somatogenic nature are inherited has yet been obtained, and the theoretical improbability of such occurrences is very great. The fact that many animals preserve a characteristic form and symmetry from age to age, and even from one geological epoch to another, is evidence that somatogenic characters are not inherited and cannot be. It is well known that certain decapod Crustacea, such as some of the common crabs and the lobster, practice self-mutilation or autotomy. Here a special mechanism has been developed in the large cheliped by the action of which it is cut off in a certain way and at a definite place. When the large claw is seized by an enemy it is quickly amputated by the twitching of certain muscles stimulated by reflex nervous impulses, and a new limb in time grows out in place of the one cast off. The Lamarckian principle does not help us much in this case, nor in supposing that the germ cells in some mysterious way register every somatogenic change, even if this is not exactly reproduced in succeeding generations.

FRANCIS H. HERRICK.

THE THIRD INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

TO THE EDITOR OF SCIENCE: The organization committee of the Third International Congress of Applied Chemistry, which is to be held in Vienna during the coming summer, has fixed the date of the meeting from the 28th of July to August 2, 1898. Some time during the month of February programs and announcements will

be sent to all persons who have been enrolled as members of the Congress.

H. W. WILEY,
Chairman of American Committee.

U. S. DEPARTMENT OF AGRICULTURE.

ELIZABETH THOMPSON SCIENCE FUND.

ON February 14th last, at the twenty-third meeting of the Board of Trustees, the following new grants were made:

No. 79. $250 to Professor Gustav Hüfner, Tübingen, Germany, for the investigation of hæmin and hæmatine. Application No. 743.

No. 80. $288 to Professor Carlo Bonacini, Modena, Italy, for researches in color photography. Application No. 741.

No. 81. $250 to Professor John Milne, Newport, I. W., England, to aid in a seismic survey of the world. Application No. 750.

Signed:

CHARLES S. MINOT,
Secretary.

SCIENTIFIC LITERATURE.

Text-book of Physical Chemistry. By CLARENCE L. SPEYERS, Associate Professor of Chemistry, Rutgers College. New York, D. Van Nostrand Company. 1897. 8vo. Pp. vii + 224. Price, $2.25.

"I have adopted the view that matter is a collection of energies in space, considering the relations of the energies to be the prime object of investigation. With Ostwald, I feel confident that the materialistic interpretation has passed its prime and has no promise in the future. Still, as this is a text-book, I give the prominent materialistic views of the present time."

These words, taken from the author's preface, make frank avowal of his scientific creed and indicate the point of view from which he proposes to discuss his subject.

Physical chemistry he defines as 'the science which has for its object the investigation of chemical changes by physical methods.' Concerning matter he says: "That which *seems* to cause a direct excitement of our senses we usually call matter." The italics are in the original. And again, "* * * we can define the different forms of matter as collections of forms of energy in space. This definition is free from any speculation; it rests on experimental evidence alone."

Speaking of the seventy-five elements, or, as he terms them, 'collections which do not separate into other collections,' the author says: "We cannot, however, believe that all the seventy-five collections will ultimately be reduced to one or more single separate forms of energy, because in that case we should have nothing left to account for the collection of forms of energy in space. We need energy and a something to enable energy to collect in space before we get a material substance. This something which enables, and perhaps causes, the energy to collect in space we shall call matter. The dissimilarity in the innumerable substances known to us come from the differences in the natures and proportions of the forms of energy collected in space."

Quotation from the work has been made at such length, because, by so doing, the peculiar attitude of its author towards matter and energy could be most clearly depicted.

Undoubtedly in close sympathy with the 'ultra-dynamists,' he nevertheless does not seem wholly prepared to abandon entirely the idea of matter, matter, that 'something which enables, and perhaps causes, the energy to collect in space.'

The topics considered in this volume are: some general remarks on energy, gases, heat, physical changes, equilibrium, chemical kinetics, phases, electro-chemistry, ions.

The order in which these themes are presented appears, to a certain extent, haphazard, as if selected at random. For instance, in spite of the author's introductory lines to his final chapter: "In these last pages we consider some properties of the ions which do not seem to fit in elsewhere," it seems difficult to understand why these properties, alluded to here, were not discussed in connection with the rest of the subject which received full and deliberate treatment in the preceding chapter on electro-chemistry.

As to the manner of treatment accorded to various themes, this may be but the natural outcome of the policy pursued by the author, who in his preface states that he has not attempted to give an historical development of

any subject, but has presented the same "in what I thought the clearest way, sometimes adopting one person's view in one part of the subject, another's view in another part, and, perhaps, my own in still another part."

While this method of procedure unquestionably endows the book with an individuality all its own, the wisdom of adopting such a course, especially in a book intended for 'self-instruction * * * as well as for class-room use,' may well be gravely questioned.

The language employed is, as a rule, clear and to the point, if, at times, unconventional. In some instances, however, the author's meaning is not readily gathered from his statements. Thus, note the second sentence of the following paragraph (p. 61): "There is another way of getting at the molecular weight, which we shall merely state. The theoretical relations are too physical to justify attention in this book." The calculus is freely used in the discussion and elucidation of formulæ and equations; the numerous problems and examples found throughout the book form a valuable feature. Typography and paper are excellent.

The author certainly does not lack confidence in his own judgment and evidently has the courage of his convictions. Thus he says (p. 177): "But in chemical action we meet only heat, light, electricity, mechanical energy or some other well-known energy. So the assumption of chemical energy is strictly gratuitous and not to be advised at all."

The kinetic theory of gases seems to have incurred his special displeasure. He writes (p. 20): "The kinetic theory is a troublesome thing and is becoming an object of ridicule. It has never directed the chemist to any new discovery or idea, unless it may be Van der Waal's theory, and that would probably have come any way." And again (p. 22), in referring to Van der Waal's theory: "Originally derived from the kinetic theory of gases, it has nevertheless none of the absurdities of that theory and will not fall with it."

Contrast with this the words of Sir William Thomson on the same theory ('Popular Lectures and Addresses,' Nature Series, Vol. I., p. 226): "A little later we have Daniel Bernouillis' promulgation of what we now accept as a surest article of scientific faith—the kinetic theory of gases."

Evidently the views of Lord Kelvin will have to undergo a radical change if they are to conform to those of our author.

FERDINAND G. WIECHMANN.

Bibliography of the Metals of the Platinum Group, 1748–1896. JAMES LEWIS HOWE. Published by the Smithsonian Institution. 1897. Pp. 318.

Professor Jas. Lewis Howe, whose initials are familiar to all who read the well selected 'Notes on Inorganic Chemistry' contributed to SCIENCE, has placed chemists under a debt of gratitude by a carefully edited volume with the above title. It forms an index to the literature of platinum, palladium, iridium, rhodium, osmium and ruthenium from 1748 to 1896; so extensive is this literature that the list of references occupies no less than 266 closely printed octavo pages. The plan is a slight modification in style of that first followed in the 'Index to the Literature of Uranium,' printed in 1870 by the present writer. Professor Howe has taken great pains to make the work complete at every point; he gives the titles of the one hundred periodicals examined, indicating by asterisks the complete sets, and at the end of the book a classified subject-index and an alphabetical author-index fill over fifty pages. In a series of references to articles dealing with a given topic the reference to the original paper is placed first. So thoroughly has the author ransacked chemical literature that he has probably overlooked very few references to the metals named. Chloroplatinates of organic bases are considered only in the case of those early formed.

To facilitate the use of the indexes the number of each title includes the year; the abbreviations used are chiefly those recommended in 1887 by the Committee on Indexing Chemical Literature of the American Association for the Advancement of Science; and the spelling of chemical terms conforms to the rules adopted in 1892 by the same Association.

For the publication of this valuable bibliography the chemical world is indebted to the Smithsonian Institution; it forms No. 1,084 of the Smithsonian Miscellaneous Collections.

Inspection of the volume enables one to form some idea of the relative activity in chemistry at different periods; in 1792 there were three papers published on the subjects included; in 1840 there were 14 papers; in 1860, 22 papers, and in 1892 there were no less than 68 papers. These numbers do not include abstracts and reproductions of original publications.

It is also interesting to note the relative frequency of the occurrence of the names of certain chemists; thus J. W. Döbereiner published 43 papers between the years 1814 and 1845; his great contemporary Berzelius, 25 papers between 1812 and 1847; H. St. Clair Deville, a generation later, published 31 papers (1852–1882), and S. M. Jörgensen has published 27 papers between 1867 and 1896, his activity being still productive. Of course, the number of the papers does not indicate the relative importance of the discoveries; W. H. Wollaston, for example, published only nine papers, but his influence on the chemistry of platinum has been notable.

The volume is clearly printed and seems to be quite free from typographical errors; Edmonde Fremy's name, however, appears as Frémy throughout the work, but Fremy never used the accent on the first vowel in his name.

Howe's 'Bibliography of Platinum' will be a necessity to every working chemist and to every scientific library.

H. CARRINGTON BOLTON.

The Development of the Frog's Egg. An Introduction to Experimental Embryology. By THOMAS HUNT MORGAN, PH.D., Professor of Biology, Bryn Mawr College. New York and London, The Macmillan Company. Pp. xi + 192. Price, $1.60.

As the first attempt to present a connected account of the development of any animal from the standpoint of the new experimental school of morphologists, Professor Morgan's book on the development of the frog will be received with much interest. The time is ripe for a summary of the experimental work on the early stages of development, showing what has and what has not been accomplished by this much discussed method of investigation. Professor Morgan gives us an account of the embryology of the frog, laying especial weight 'on the results of experimental work, in the belief that the evidence from this source is the most instructive for an interpretation of the development.' We shall hope, therefore, in its perusal to learn how much has been accomplished in making clear the course of events in the embryology of a single animal by means of experiment. The egg of the frog has become the classical object for this sort of research, so that a more favorable choice of subject for this purpose could not be made.

The scope of the work is not confined, however, to results achieved by experiment. The book undertakes to give a 'continuous account of the development, as far as that is possible, from the time when the egg is forming to the moment when the young tadpole issues from the jelly membranes,' drawing upon both descriptive accounts of the normal development and experimental work to make it complete. The sub-title, however, makes us justly expect that the experimental results will form the chief aim of the book.

After a half-page introduction on the egg laying and copulation of the frog, Professor Morgan opens his account in Chapter I. with a discussion of the formation of the sex-cells, followed in Chapter II. by a description of the processes of egg laying, formation of the polar bodies and fertilization. With Chapter III. we enter upon the first account of experimental work, a short *résumé* of the researches of Pflüger, Born and others upon cross-fertilization in the Amphibia.

Chapter IV. treats of the normal cleavage of the frog's egg, with the variations met with under natural conditions. The question is proposed: What determines the plane of cleavage in the unsegmented egg? Roux's contention that this is determined by the plane of apposition of the two pronuclei is stated, but the actual determining factor is held to be still in doubt, with the evidence rather against Roux's view. Further discussion of this question is reserved for a later chapter. As to the factors determining the form and arrangement of the cleaving cells, the author discusses here only the surface tension theory, again reserving, according to a plan which can hardly be said to conduce to unity other supposed factors

to a much later chapter. The discussion at this point takes the form of an illustrated account of Roux's experiments on the form and arrangement of oil-drops divided into parts similar to the blastomeres of the egg. The conclusion is drawn that surface tension is an important factor in the arrangement of cleaving cells, but that these are influenced also by many other factors which prevent them from showing always the typical arrangement demanded by surface tension alone.

Chapters V. and VI. are devoted to a descriptive account of the developmental processes from cleavage until after the establishment of the germ layers. The formation of the embryo by concrescence makes the basis of an exceptionally clear and satisfactory description of the complicated processes taking place. In this connection is given a brief statement of the experimental evidence (formation of extra-ovates, etc.) of the changes taking place, and of the correspondence of particular parts of the egg with parts of the later embryo, and the attempts of His to explain many of the processes of development by means of experiments with elastic plates are outlined.

The nucleus of the book is formed by Chapters VII. to XII., which are devoted to the experiments for which the frog's egg has served as the most frequent object in the study of early developmental processes. This account of experimental work is not brought into any close connection with the foregoing description of the normal development of the frog. The latter is closed off, up till after the formation of the germ layers, then the experimental work on early stages is taken up. The account of this is classified only loosely according to the processes and problems studied, the arrangement adopted being chiefly a historical one.

Chapter VII. gives an account of the experimental production of embryos with spina bifida, with especial reference to its bearing on the formation of the embryo by concrescence of the two halves of the germ ring.

Chapters VIII. to XI. are devoted to an account, arranged chiefly historically, of the experiments of Pflüger, Born, Roux and many later investigators on the modifications in development induced by an altered relation of the egg to the direction of gravity, by compression and by killing or isolating individual blastomeres in early stages. This forms one of the most instructive chapters in the history of biological investigation and theory, illustrating and emphasizing, as it does, the necessity for extreme caution in generalizing the results of experiments and observations on single forms, and showing how false may be the conclusions based upon the clearest evidence when that evidence is not gathered from extensive comparative researches. The lesson thus gained has been of the greatest importance and has doubtless been one of the most valuable results of this series of investigations. It would be interesting to review here, following Professor Morgan, the problems proposed, the experiments undertaken to answer these questions, the conclusions drawn from these experiments, and the continued modification of these conclusions as the circle of experimentation became wider.

The history of the development of opinion as to the conclusions to be drawn from the 'total' or 'partial' development of isolated blastomeres, of the theories concerning the part played by gravity in cleavage, and of the general factors determining the direction and position of cleavage planes, is remarkably instructive. Almost more important, as leading to more definite positive conclusions, is the history of the gradual change from the view that the nucleus is the all-important factor in formative processes, to that which seeks the essential factors in the cytoplasm, culminating with Driesch and Morgan's demonstration that in the ctenophore purely cytoplasmic injuries to the egg result in corresponding modifications in the larva. But for a full discussion of these and other matters the reader must be recommended to a perusal of the book itself.

A few words may be added as to Professor Morgan's own conclusions in regard to some of the problems discussed. Although he states in the preface that he has avoided the discussion of theoretical questions, as out of place in such a book, he does give his views on a number of important points.

In Chapter XII., 'Interpretations and Conclusions,' a clear and appreciative survey is given of Roux's profound analysis of the problems of

development in his earlier papers, and of the grounds for his later conclusions in favor of the qualitative nature of cleavage and the 'self-differentiation' of the blastomeres. This review is most satisfactory in its spirit of fairness and in its appreciation of the magnificent work of Roux, and stands in refreshing contrast in these respects to much recent scientific (?) discussion of this investigator's views on the other side of the Atlantic. The author then proceeds to develop the difficulties in Roux's theory and presents grounds for a different view. He points out that in all cases, except the ctenophore egg (and the unmentioned gasteropod egg), it has been shown that the early blastomeres have each the power to produce the whole embryo, though under certain circumstances they may not do so. The author believes that there is no profound difference in principle between the conditions in the ctenophore (and gasteropod?) egg and elsewhere; the divergent results in this case, he thinks, may be explained by the fixity of the protoplasmic forms in the ctenophore egg, or some kindred condition. This totipotence of the embryonic cells may persist, Professor Morgan believes, to late stages. The chief reason why cells of later cleavage stages cannot produce entire embryos is because their power of cell division is limited; hence enough cells cannot be produced to form a complete embryo. (The very important work of Crampton, showing that the development of the isolated blastomeres of the gasteropod is, like that of the ctenophore, throughout partial in character, is unaccountably left unmentioned by the author, though he cites other articles which appeared in later numbers of the same journal in which Crampton's paper was published.)

What, then, brings about the later differentiation of cells if all the blastomere are totipotent? The author rejects the theory of qualitative division of the nucleus; he holds it impossible also that the interaction of equivalent blastomeres should induce differentiation. That the distribution of yolk, etc., does not determine differentiation is shown by the production of normal larvæ from that half of the echinoderm eggs which contain no yolk. Professor Morgan can only emphasize again that the experiments on the ctenophore egg indicate that the factors in differentiation, whatever they may be, are situated in the cytoplasm. What these factors are, or even whether they may be placed in the category of physico-chemical causes, we do not know.

The remainder of the book, except the last chapter, is taken up with a descriptive account of the development of the frog's egg, from the establishment of the germ layers to the moment when the young tadpole emerges from the jelly membranes. This account is chiefly abridged from Marshall, and the figures are mostly copies from the same author. Experimental work on the later stages is not introduced, the remarkably interesting experiments of Born on the grafting of parts of young tadpoles being too recent to be included in the present volume.

The last chapter is a brief review of researches on the effects of different temperatures and different lights on development. An appendix gives some hints on reagents, methods of preservation, etc., and the whole is closed by an extended bibliography.

Those chapters of the book (VII.–XII.) which deal with the experimental work on the early stages of development will be found a most satisfactory presentation of the results in this interesting line of work. The *résumé* is extended enough to bring out all essential points, is clearly written, fair and appreciative in its account of opposing views, and the conclusions set forth by the author are cautious and undogmatic.

The partially historical arrangement of the material is advantageous in many respects. It brings out with especial clearness the necessity of caution in interpreting experiments on simple organisms, shows the fluctuations of opinion in regard to the problems involved, and aids essentially in understanding the present status of investigation and opinion in regard to these matters. On the other hand, this arrangement brings the discussion of the experimental work out of relation with the rest of the book. We should expect, from the title of the work and the preface, that the descriptive account of the embryology of the frog would give the order of development of the subject. Certain processes which require explanation coming up in this account, it might be antici-

pated that the experiments bearing upon these points would be detailed and the conclusions to be drawn from them pointed out. In this way it would have become much clearer how much or how little experimental work had done in elucidating the development of the frog, and the book would have been given a unity which it does not now possess. The descriptive portions and the account of experimental work might have been bound under separate covers, neither volume showing a decided lack of the matter treated in the other. It may be questioned if a volume on the general subject of 'Experimental Embryology,' from so competent a hand as that of Professor Morgan, with no attempt even nominally to limit the discussion to a particular egg, would not have met the demand more precisely than the present work. The descriptive chapters will hardly take the place of Marshall's work on the embryology of the frog, and this portion of the book seems in some respects not so well presented as that on the experimental results. In some chapters the arrangement is a confused one. Thus, after an extended discussion of the cleavage of the egg and especially the variations in that process, and after the egg has been brought to the blastula stage, we find again (p. 41) a paragraph adding some new facts as to the first and second cleavages. At times one misses a clear-cut statement of the question upon which a set of observations or experiments bear. For example, in the account of Roux's experiments with oil-drops, pp. 43–47, it is mentioned only incidentally that the question here is as to the part played by surface tension in cleavage, so that the point might easily be missed by one not acquainted with previous discussions on the subject. In the descriptive chapters typographical and other errors also are more frequent; a particularly confusing matter is the incorrect reference in the text to the lettering of the figures, in a number of cases. Thus occurs on p. 41 ('Fig. 12 G. H.'), p. 105 ('A'–B²' and 'Fig. 33 B'), p. 156 ('Fig. 47 B'). In several cases the discussion would be made much clearer if the successive cleavage planes could have been numbered in the figures.

The descriptive part, however, whatever be its merits or demerits, is not the distinctive feature of Professor Morgan's book; it is for the account of experimental work that it will be read, and for this it will be found of the greatest value.

HERBERT S. JENNINGS.
MONTANA COLLEGE OF AGRICULTURE AND MECHANIC ARTS, BOZEMAN, MONTANA.

Geologic Atlas of the United States, Folio 36. Pueblo, Colorado, 1897.

The folio consists of seven pages of text, signed by Grove Karl Gilbert; a topographic map; maps showing the areal geology, economic geology, structure sections, deformation and data pertaining to artesian water; a sheet of columnar sections, and a sheet showing typical fossils and special types of outcrop. The scale is 1: 125,000, and the area described is comprised between parallels 38° and 38° 30′ and meridians 104° 30′ and 105°.

The quadrangle includes a portion of the Great Plains close to the base of the Rocky Mountains. The topography is partly of the foothill type and is in general sufficiently rugged to exhibit clearly the stratigraphy and structure. In the western part are portions of the great hogback formed by the upturned edge of the Dakota sandstone.

The formations range from Archean to Pleistocene. The Paleozoic rocks have a thickness of but two or three hundred feet and their exposures are unimportant. The Juratrias rocks, comprising bright-colored shales and sandstones, have an extreme thickness of 2,500 feet, but their surface extent is small. The Cretaceous rocks range from the Dakota formation to the Pierre and cover nine-tenths of the area. They consist chiefly of gray shale; in a total thickness of 3,800 feet there are only 75 feet of limestone and 300 to 500 feet of sandstone, the latter being at the base of the series. One hundred feet of alluvial sand and gravel are referred to the Neocene, and other alluvial deposits to the Pleistocene.

Unconformities appear at the base of the Paleozoic, Cretaceous, Neocene and Pleistocene formations, and the geologic history is correspondingly complex. The structure of the Paleozoic and Juratrias rocks was ascertained only in the limited area of their exposure. The

structure of the Cretaceous rocks was determined more completely, and, as it has important economic bearings in connection with artesian water, a special sheet is devoted to its presentation. In a plaster model the upper surface of the Dakota sandstone was restored so as to exhibit its flexures and faults, and a lithographic plate was prepared from a photograph of this model. The general trend of the flexures is NNW, and the faults have the same course.

The flext rocks have been subjected to erosion during a large part of Tertiary time, with the result that the relief expresses the principal facts of structure with great fidelity. Inclined outcrops of the resistant Dakota sandstone form monoclinal ridges from 600 to 1,200 feet in height. A limestone at the base of the Niobrara formation is exprest in a system of sloping plains, mesas and ridges, which the details of structure render somewhat complex. The outcrop of another limestone is markt through a wide range of territory by a characteristic terrace, and other terraces are determined by Neocene and Pleistocene alluvial formations.

Among the economic materials are sandstones available for structural purposes, limestones available for lime, and flux, gypsum and fireclay. Artesian water, contained in the Dakota sandstone, underlies nine-tenths of the quadrangle, and the structural relations indicate that in about one-sixth of the quadrangle the head is sufficient to carry it to the surface. A special map indicates its distribution, showing separately the flowing and pumping areas and indicating by contours the estimated depth of the water below the surface of the ground.

The text is adjusted to the needs of lay readers; technical language is avoided, so far as may be, and where avoidance is impracticable the terms used are explained.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON, 286TH MEETING, SATURDAY, JANUARY 29.

MR. WILLIAM PALMER read a paper on the Birds of the Pribilof Islands, Alaska, stating that 69 species were known from that locality. Of these, 18, mostly stragglers, are American, 28 are exclusively Pacific, 17 are circumpolar and but 6 Asiatic. None of the Asiatic species breed on the islands, and but one of the American species. Seventeen of the Pacific forms and four of the circumpolar, however, breed on the Pribilofs. With the exception of eleven land birds, four of which are common and breed, the entire avifauna is composed of water birds and waders. Thousands of birds pass southwards through the Aleutian Islands during the autumnal migration to their winter homes on the coast of Asia. Others journey direct to the Hawaiian and other islands of the Middle and South Pacific, thus making the longest transoceanic journeys known to be made by birds.

Dr. L. O. Howard presented, under the title 'The European hornet in America,' some brief notes about *Vespa crabro*. He exhibited specimens of the larva and pupa of this insect taken by Dr. E. G. Love from a nest found near Jamaica, Long Island. He also showed photographs of the nest, both in longitudinal and horizontal section. He showed that this insect has been present in this country in the vicinity of New York City certainly since 1848, but that during that time it has spread less than 150 miles from its point of introduction, the most distant point at which it has certainly been found being Anglesea, N. J. Reported occurrences in Maryland and North Carolina were considered doubtful by the speaker. He further called attention to the fact that, while in Europe the species usually inhabits outhouses, in this country its nests have almost invariably been found in hollow trees.

F. A. LUCAS,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of January 17, 1898, seventeen persons present, a paper by Charles Robertson, entitled 'New or Little Known North American Bees,' was read in abstract and referred to the Council for publication. Dr. A. C. Bernays addressed the Academy on biological facts as evidence of man's place in nature. He illustrated certain facts from the ontogeny of man by description and blackboard sketches, and tried to explain the anatomical peculiarities in the structure of

man and the lower animals by the biogenetic law of Haeckel. He also made some suggestions about the best method of studying and of teaching anatomy. It was claimed that in the biogenetic law of Haeckel a scientific background, or rather a working hypothesis, was given, by means of which the recorded facts of zoology, botany, paleontology, etc., were made understandable and really became useful to science. He also gave a definition and illustration of the meaning of the term differentiation as used in biology.

Three new members were elected.

At the meeting of February 7, 1898, fourteen persons present, a paper by Professor A. S. Hitchcock, on the ecological plant geography of Kansas, was presented and referred to the Council for publication. Professor L. H. Pammel spoke on the anatomical characters of seeds from the standpoint of systematic botany, presenting in abstract the results of an extensive study of the subject, on which he has been engaged for some years past.

Twenty-four new members were elected.

WILLIAM TRELEASE,
Recording Secretary.

AMERICAN CHEMICAL SOCIETY.

THE regular meeting of the New York Section of the American Chemical Society was held on Friday evening, February 4th. Dr. Wm. McMurtrie presided, and seventy-two members and vistors were present.

The chairman opened the meeting with a very interesting surprise in the announcement that he had just received a half-gallon of liquid air from Mr. Tripler, and the first half-hour was occupied in an exhibition of its properties.

The liquid was ladled out of a covered receptacle packed in several thicknesses of felt, very much as if it had been ordinary ice water, but on pouring it into any glass, porcelain or iron vessel it boiled with great violence until the container cooled to the temperature of the intensely cold liquid, which means about —310° F.

Drops falling on the lecture table immediately took the spheroidal form and ran about exactly as drops of water on a hot stove. Placed in a glass beaker the liquid first boiled, then became clouded with a crystalline precipitate of carbon dioxide, which was present as an impurity, and from which it was separated by filtration through an ordinary paper filter, and the clear liquid was caught in a double-walled glass cylinder. The space between the walls, having been exhausted, to produce a vacuum, the clear, slightly blue liquid air remained in the tube for over an hour before complete evaporation. Among other experiments, alcohol was quickly frozen, rubber tubing was hardened by the low temperature so as to break when struck by a hammer almost like glass, and a piece of thin sheet iron, after immersion in the cold liquid, became very brittle.

The following papers were read: 'Determination of Boric Acid,' T. S. Gladding; 'Recent Progress in the Chemistry of the Leather Industry,' J. H. Yocum; 'Review of Chemical and Physical Methods for Examining Documents and Handwriting,' C. A. Doremus.

The next meeting will be held on March 11th.

DURAND WOODMAN,
Secretary.

NEW BOOKS.

Text-Book of Zoology. T. JEFFERY PARKER and WILLIAM A. HASWELL. London and New York, The Macmillan Company. 1897. Vol. I., pp. xxxv + 779. Vol. II., pp. xx + 683. \$9.00.

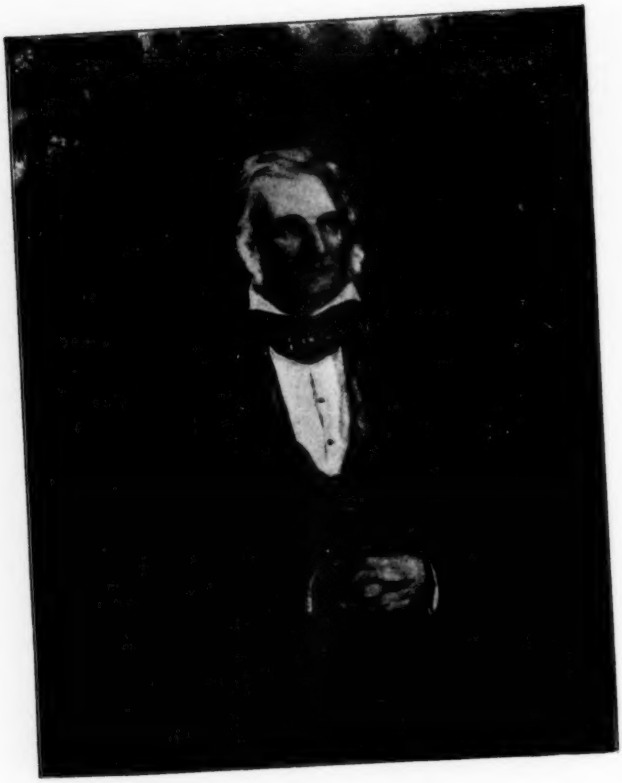
Lehrbuch der Entwicklungsgeschichte des Menschen. J. KOLLMANN. Jena, Gustav Fischer. 1896. Pp. xii + 658. 15 Marks.

Organographie der Pflanzen. K. GOEBEL. 1st Part, *Allgemeine Organographie.* Jena, Gustav Fischer. 1898. Pp. ix + 232. 6 Marks.

Laboratory Experiments on the Class Reactions and Identification of Organic Substances. ARTHUR A. NOYES and SAMUEL P. MULLIKEN. Easton, Pa., Chemical Publishing Co. 1897. Pp. 28. 50 cts.

The Freezing Point, Boiling Point and Conductivity Methods. HARRY C. JONES. Easton, Pa., Chemical Publishing Co. 1897. Pp. vii + 64. 75 cts.

Garden Making. L. H. BAILEY. New York and London, The Macmillan Company. 1898. Pp. vii + 417. \$1.00.



John James Audubon.